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DISRAELI KOBAK, M.D., Editor

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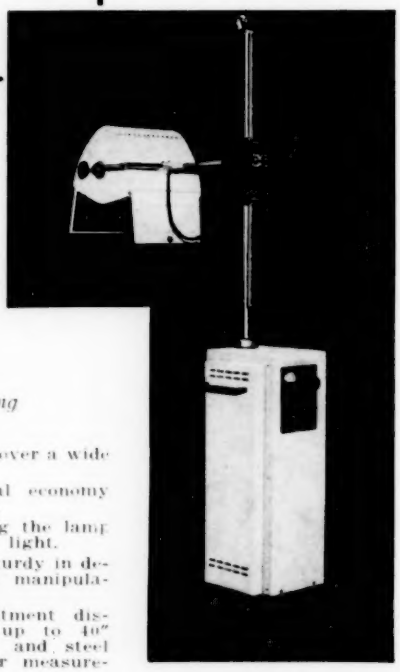

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STUDIES ON BIOLOGIC EFFECT OF COLORED LIGHT *

HERMANN VOLLMER, M.D.

NEW YORK

Numerous contradictory reports are found in the literature on the biologic effects of the visible portion of the spectrum. Nowhere can one find a common biologic denominator for the various experimental data. Neither the non-specific "irritation theory" (Reiztheorie) seems to be generally applicable, nor is there sufficient experimental basis for the biologic specificity of certain wavelengths. Hence it is easy to understand the present skeptic attitude toward the biologic studies on the qualities of the visible spectrum. As is so often the case, charlatans have occupied this relatively unexplored field, and have exploited it for their purposes. Despite the absence of objective evidence, so-called "chromotherapists" have worked out definite indications for the use of colored light. Spontaneous cure or psychic effect occasionally seem to confirm their assertions. They have brought discredit upon a scientific field which is yet to be developed.

Under the circumstances the publications of Fritz Ludwig and Julius von Ries[1] of the laboratories of the Engeried Hospital, Bern, were especially welcome. They not only communicated a series of interesting results, but also suggested the existence of a systematic relationship, as for instance the biologic antagonism between red and ultraviolet light. The following is a summary of their results: In experiments with plants, wheat sprinkled with red colored water showed only a slight degree of germination, while wheat sprinkled with blue colored water germinated more luxuriantly than when moistened with water. These differences did not appear in experiments conducted in the dark. The authors therefore believed that "light-death" due to red colored water was ascribable to the red light. The results were the same when the water was colored with neutral red or with eosin. While germination of the wheat was hindered by the red light, growth was stimulated, the forms of the leaves changed, and the green coloring becoming less intense. In animal experiments, addition of cholesterol to food freed from vitamins had no influence on the weight of rats, nor did the addition of cholesterol treated with red light influence it. Cholesterol irradiated with a quartz lamp brought about a temporary increase of weight. Activation of cholesterol by ultraviolet rays was destroyed by subsequent irradiation with red light. In the same way, vigantol (irradiated ergosterol) was rendered inactive by irradiation with red light. The effect of ergot (secale cornutum) was diminished or obviated by red light treatment. Ergot preparations, thus made ineffective, were reactivated by a subsequent treatment with ultraviolet rays.

According to these experiments, a definite antagonism is assumed to exist between the effects of red and ultraviolet light, but it is further shown that this rule does not apply generally. Rats bred under red and blue light showed a contrary response. Those bred under red light developed into strong, giant animals which weighed as much as 80 grammes more than normal rats. Rats reared under blue light showed the same growth as the normal animals. It was discovered quite by accident that ants repeatedly approached the red light, which they apparently found better suited to their

* From the Pediatric Service (Chief of Staff, Béla Schick, M.D.) and the Department of Physical Therapy (Attending, William Bierman, M.D.), Mount Sinai Hospital, New York.

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requirements. It was further shown that the activity of progynon was increased by red light, and destroyed by ultraviolet light, and that the inactive hormone could be reactivated by red light. The influence of various hormones on the growth of wheat in water was definitely modified by treating these hormones with red or ultraviolet light, respectively.

The authors believe that various portions of the spectrum have a specific influence on the hormones, and that endocrine problems may find their solution through photo-biologic studies. They believe that they have furnished proof that damage due to ultraviolet light, hyperpigmentation, non-rachitic disturbances in growth and hypofunction of sex glands may be benefited by treatment with red light. The latter statement is confirmed by Küstner.[2] He not only reports favorable results of treatment with red light in hypofunction of the sex organs, but also in uterine hemorrhages. Küstner further made the interesting observation that the Aschheim-Zondek phenomenon was accelerated in mice which were kept under red light: the reaction appeared after 50-55 hours, instead of after four days. Also Marshall and Bowden[3] found an acceleration of the estrous cycle in mice by treatment with red light. In this connection the report of A. Jores[4] is of importance, because the pressor and uterus-stimulating substances of the hypophysis were doubled or tripled by change from light to darkness.

In all these observations it has to be decided whether the effect is due to the exclusion of the effective light of short wavelength or to the specific influence of certain wavelengths of the visible spectrum. Pincussen's[5] animal experiments on the influence of various wavelengths on the blood sugar favor acceptance of a selective photodynamic effect: ultraviolet, after an initial hypoglycemia, leads to a moderate hyperglycemia; blue light causes a slight rise; red light a marked rise of blood sugar. According to Pincussen ultraviolet acts by affecting the superficial layers of the skin; the region from blue to yellow through its influence on the blood, while red to infra-red rays act on the deeper layers of the skin.

The studies of Ehrenwald[6] on the "photodermatic tonus reflex" elicited by colored light also indicate a selective photodynamic effect. The eyes of the experimental subject were blindfolded and the skin of the face and neck was exposed to red and blue, respectively. The persons were told to hold their arms stretched forward, parallel to each other. Ehrenwald observed a deviation of the arms from their initial position toward the red light and away from the blue. This tonus reflex is considered to be a function of the vestibular apparatus, since it can not be elicited if the vestibular apparatus has been destroyed by disease.

These statements culled from the literature are extremely fascinating Therein lies the danger of this field of study: it has boundless implications and numerous correlations with the every-day life of animals and plants, already considered by Goethe in his "Farbenlehre." Therefore critical observation is essential to separate the truth from the purely sensational, and this must be applied first of all to the methods which often harbor numerous sources of errors. Even the interesting work of Fritz Ludwig and Julius von Ries[1] is open to criticism on two vital points, which may be rejected even from the theoretic point of view. Their conclusion that ultraviolet-irradiated ergosterol is rendered inactive by red light is unacceptable on theoretic grounds. A substance cannot be influenced by wavelengths which it does not absorb. The experimental result is not denied, but rather its interpretation. The inactivation of viosterol, by the method described, is possible, but is probably due to the irradiation in open vessels, whereby the vitamin is destroyed by oxidation. A specific influence of red light does not

enter into consideration. The report on the increased effectiveness of progynon by red light irradiation must be considered with similar skepticism; changes in concentration apparently, have a part in it. The authors in their experiments with growing wheat in hormone solutions, treated these solutions with red light for six hours at a distance of 40 cm. with a 200 watt bulb. With such an intensive influence of heat, the observed changes of the hormonal effect can not be attributed solely to the red light. But these critical objections do not necessarily refute the possibility of a specific influence of red light in a different manner and in a different degree.

During the past years I have investigated clinically and experimentally some questions relating to the biology of light, and made some new observations. I have not dealt with all aspects of the effect of colored light, but I wish to submit these fragments, with the intention of stimulating further investigation.

In most of these experiments I used the commercial red and blue cellophane, manufactured by Du Pont, which is inexpensive and easy to handle. It is not monochromatic, but when used in several layers is quite satisfactory. The spectrometric examination showed that red cellophane completely absorbs all wavelengths below 565 mμ when used in one layer, and up to 580 mμ when used in two layers. Blue cellophane showed strong absorption above 600 mμ, diffuse bands between 600 and 500 mμ. Here the objection may be made that I did not work with monochromatic light. The fact that the experiments would then have been much more complicated and the cost prohibitive, is certainly an insufficient defense. In studying the effect of colored light, specificity in the narrower sense of monochromasia does not enter into question, as the literature and my experiments show. Red light, for instance, with which this study deals primarily, acts chiefly by the exclusion of chemically active light, as will be shown later. Examination with photographic paper has proved that cellophane, in double layers, is adequate for this purpose. Of course, the cellophane used must be renewed from time to time as it "bleaches" and becomes useless after a certain time.

Experiments With Plants

Method. — Petri dishes were filled with a layer of cotton, on which a certain number of lentils was placed. The cotton was moistened every other day with the same amount of water for each dish. The dishes were covered with wire frames about 20 cm. high, which were then papered with red and blue cellophane, respectively. Daylight was carefully excluded. Thermometers were fixed within the wire frames in such a manner that they could be read from the outside. As no difference in temperature between the red and the blue ever appeared, temperature notations are not given in the proctocols. The dishes were placed in a row, each at the same distance from the closed window, so that the same amount of light reached the cellophane filters during the entire experiment.

This arrangement is less objectionable than that of Ludwig and von Ries, who treated wheat with water colored by eosin. In their experiment the chemical influence of eosin must be considered as well as that of light. This objection is valid even though the authors obtained the same results with neutral red. It is not impossible that eosin and neutral red could influence the germination of wheat in the same manner.

Results. — In accordance with Ludwig and von Ries, germination of the lentils was delayed under red light. But within a period of six to ten days the red sprouts reached the same height as the blue ones, and later on they grew markedly higher. In this latter state of growth, the size of the leaves

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PROTOCOL 1. — *Experiments started February 5th, 1936, 100 lentils each.*

Date	Red	Blue
Feb. 7	no germination	beginning germination
" 8	23% germination	30% germination
" 10	weaker light green-yellow germs	strong green germs
" 12	sprouts as big as in blue	sprouts as big as in red
" 13	markedly taller, less dense than in blue	
" 15	On an average about 1.5 cm. higher than in blue. Tallest red sprout 3 cm. taller than tallest blue sprout. Average leaf size in red somewhat superior to that in blue. Red stems perhaps somewhat thinner.	
" 20	Weight of the 10 longest sprouts cut from the lentils:	
	1.424 gr.	1.189 gr.
	difference: 0.235 gr. = 19.8%	
	Total length of the 10 longest sprouts:	
	135.8 cm.	116.8 cm.
	difference: 19 cm. = 16.3%	

PROTOCOL 2. — *Experiments started November 2, 1936, 60 lentils each.*

Date	Red	Blue
Nov. 4	5 germs	13 germs
" 5	8 "	21 "
" 6	9 "	33 "
" 7	15 "	38 "
" 9		germs more numerous and tall
" 11	21 "	germs bigger and in the average markedly taller
	smaller than in blue, one germ taller, shooting up.	
" 12	Four sprouts rising above the brink of the bowl	16 sprouts rising above the brink of the bowl
" 14	growing quickly and reaching the size of the sprouts in blue	
" 18	equal	equal
" 19		leaves better developed than in red
" 21	tallest sprouts in red surpassing those in blue	
" 23	tallest sprouts in red markedly surpassing those in blue	
" 28	average superior to blue	
Dec. 4	tallest sprouts in red materially above those in blue	

did not show any regular differences, but the length and weight of the sprouts, when cut from the lentils, showed a difference of more than 15 per cent on an average (protocols 1, 2).

One may well ascribe this effect of red light to the exclusion of light. The exclusion of light is known to bring about the phenomenon of etiolation which is characterized by elongated stalks, small yellowish leaves and accelerated growth. There is no reason to assume that the red light has a specific influence on the growth of the plants.

Animal Investigations

a. Experiments with guppies

The following experiments were undertaken to determine preference for certain color of light.

Method. — A rectangular aquarium is divided into two equal parts by a reflecting aluminum sheet which allows the fishes to swim, near the bottom, from one part of the basin to the other. The glass wall of one-half is covered with a double layer of red cellophane, the other half with blue. As the aluminum sheet reaches the top of the basin, no interchange of light can take place between the red and the blue sections. Feeding is done in both parts with the same amount of food. At several intervals during the day, the fishes are counted in both halves.

Results. — Observation during the first three weeks shows a definite preference on the part of the guppies for blue light (protocol 3). Expressed

PROTOCOL 3. — *Experiments on 13 Guppies begun October 27th, 1936.*

Date:	Number of fishes in blue:	in red:	remarks:
1936			
Nov.			
4.	11	2	to-day separated by aluminum
6.	10	3	
7.	12	1	
7.	13	0	
9	11	2	
11.	12	1	
12.	12	1	
13.	9	4	
13.	13	0	
14.	11	2	
18.	11	2	
18.	13	0	
20.	10	3	
21.	11	2	
23.	13	0	
25.	11	2	from Nov. 25th on feeding only in red, in order to elicit a conditioned reflex.
27.	10	3	
28.	10	3	food only in red
30.	7	6	food only in red
Dec. 2	10	3	no food in both parts
2.	11	2	
3.	9	4	fresh food in red
4.	13	0	fresh food in red
5.	10	3	fresh food in red
7.	9	4	fresh food in red
8.	Young fishes are born. Great excitement among the animals, continuous swimming in all directions.		

in figures, the fishes prefer the blue to the red by 7.5 times. After three weeks, feeding takes place only in the red half. Consequently the fishes have to go to this part in order to find food. But during a period of two weeks it was not possible to elicit a conditioned reflex in such a manner to let the red acquire an alluring quality so that it was less avoided. It is true that shortly after the food was given, more fishes were seen in the red, but immediately after they had taken the food, they returned to the blue.

b. Experiments with ants

Method. — An "Austin Ant House," commercially available, is placed near the window. The upper frame contains two openings for feeding and watering. Feeding consists of sugar and occasionally a fly, and is administered exclusively through the right opening. Twice weekly, 15 to 30 cc. of water are given through both the openings. The glass-panes are covered with double layers of red and blue cellophane respectively, both on back and front, so that the ant heap is divided into a blue and a red part. As the ants might prefer the one or the other side for reasons other than the light — feeding place, etc. — the red and the blue coverings are interchanged repeatedly.

Results. — Protocol 4 shows that the ants apparently prefer the red light. They seem not only to prefer the red to the blue, but also to daylight. It is striking that the dead ants are buried almost exclusively on the blue side, while, on the other hand, the laying of eggs by the females and the taking care of the breed by the workers, continuously and exclusively take place in red.

These observations agree essentially with those recorded by Ludwig and von Ries. They claim validity only for the conditions given which are not the natural conditions of the life of ants.

PROTOCOL 4. — *Study of ants begun November 3rd, 1936, the ants show a preference for the left side, with the queen always on the right.*

1936:	
Nov. 13:	Left side covered with red cellophane on both front and back, right uncovered.
" 17:	Most of the insects, including the queen, prefer red side. Right side is covered with blue cellophane, left remains red.
" 18:	Almost all insects in red.
" 29:	Daily observation shows almost all insects continuously in the red; the queen most often found in blue, but occasionally comes to red.
Dec. 1:	All in red, including queen.
" 12:	All in red, never coming to blue.
" 24:	All in red, none in blue.
" 26:	None in blue. Blue filter removed, red remains.
" 27:	Ants remain on red left side, none seeks the daylight. When alarmed by the whistle, the ants move in all directions, but ultimately return to the red side.
" 28:	Red filter removed. The whole "heap" in daylight.
	In January, February, March 1937, the ants hibernate. Little movement, and almost no food taken.
1937:	
April 28:	New life in the "heap." The ants build new roads, transport the soil, and work industriously all day long.
May 5:	Left side covered with blue cellophane, right with red, but only in the front.
" 7:	Insects obviously prefer red side. Ants dwell only on the red side of the wooden stand, never on the blue.
" 14:	Always many insects in the red "lodge," none in the blue.
June 30:	In the last weeks insects occasionally found also in blue. Eggs are exclusively placed in the red "lodge."
Nov. 15:	The dead ants are buried on the blue side. Eggs are placed, licked and cared for exclusively in the red "lodge."

c. Experiments with flies (Musca domestica)

Method. — The flies were kept in a cardboard box 18 by 20 by 40 cm. in size, the lid of which consisted half of red, and half of blue cellophane. A separating wall in the middle reached to the top and was lightproof, but left a sufficient passage for the flies near the bottom. Food and water were given in both parts.

Results. — During the time of observation — 25 days — a preference for neither the red nor the blue could be noticed. Würtzen[7] declares that flies avoid red light. The same is said of blue light by others. Dr. L. Lichtwitz told me personally that he could completely control a great plague of flies in his animal rooms by applying blue window panes.

Apparently flies seek the full daylight, neither red nor blue satisfying their requirements. Thus one can understand that they prefer neither of the colors, when they have a choice between red and blue.

The observations on guppies and ants may be explained in a similar simple manner, without presupposing a specific "phototropism." Guppies also are animals which naturally seek the light. They prefer blue light to red, as the red contains no short wave rays, and for this reason is perceived as relatively dark. On the other hand, ants are animals which naturally seek semi-darkness. They live in places protected from light and purposely avoid full sunlight. Therefore, they apparently prefer red to blue or unfiltered daylight.

d. Influence of red and blue light on the growth of rats

Method. — Litters of rats, 14-20 days old, were separated into two or three groups of about the same weight, and put into different cages. The cages were arranged in a triangle, over the center of which a 200 kilowatt tungsten

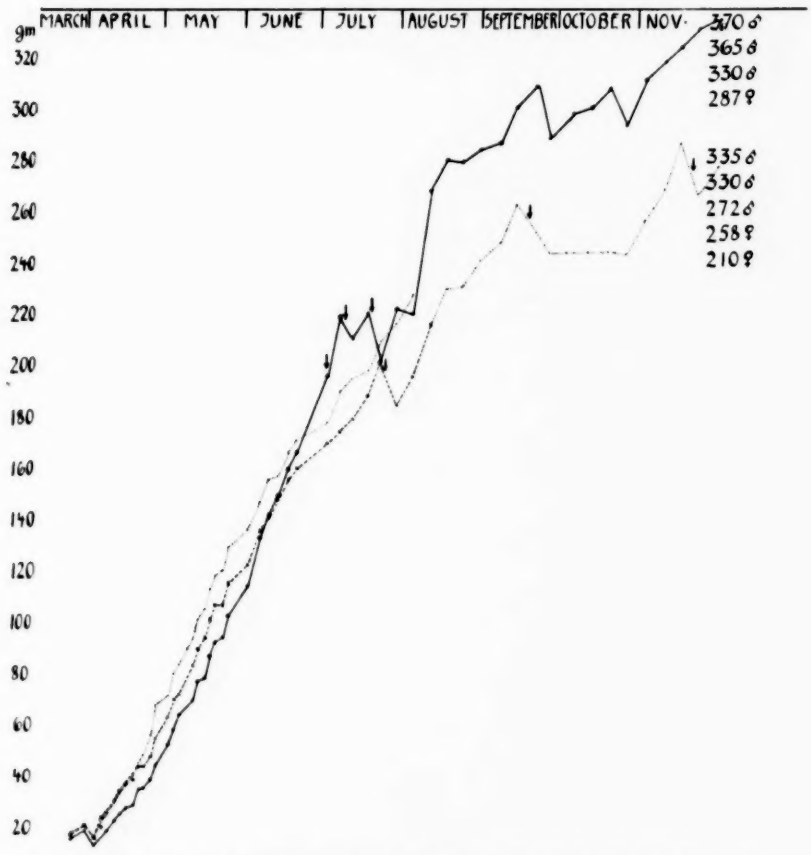

Fig. 1. — Experiment A. Average weight of rats kept under red (——), blue (- - - - -), and daylight (. . . . .). ↓ = litter.

bulb served as the source of light. One cage received the full light through a clear glass lid; the lids of the other two cages were covered with double layers of red and blue cellophane respectively. Ventilation was effected by a slit on the sides covered by a metal sheet, the inner side of which was darkened with soot, in order to avoid reflection of light. Having found this ventilation inadequate during the hot summer months, we worked subsequently with open wire cages. These were placed either in small dark rooms with colored light sources, or in a room with daylight. The animals received a normal generous diet, and were weighed regularly. At the end of the experiment, the rats were narcotized by nembutal, and their blood taken from the carotid. The serum-Ca was determined by the method of Kramer-Tisdall, the serum-P by that of Kuttner. An x-ray diagram was taken of all the animals. Post mortem examinations were carried out with special attention of the endocrine organs.

Results. — Experiment *A* consisted originally of 20 rats, 18 days old, taken from three different litters. They were divided into groups of eight red light, six blue light and six daylight rats. Figure 1 shows the average weight of each group. The blue and the daylight animals show no noteworthy difference in the course of their weights. The red rats seem to be a little retarded in their growth up to maturity, but later they exceed the daylight animals definitely and continuously. At the end of the experiment the red animals weighed on an average 58 grammes more than the daylight rats.

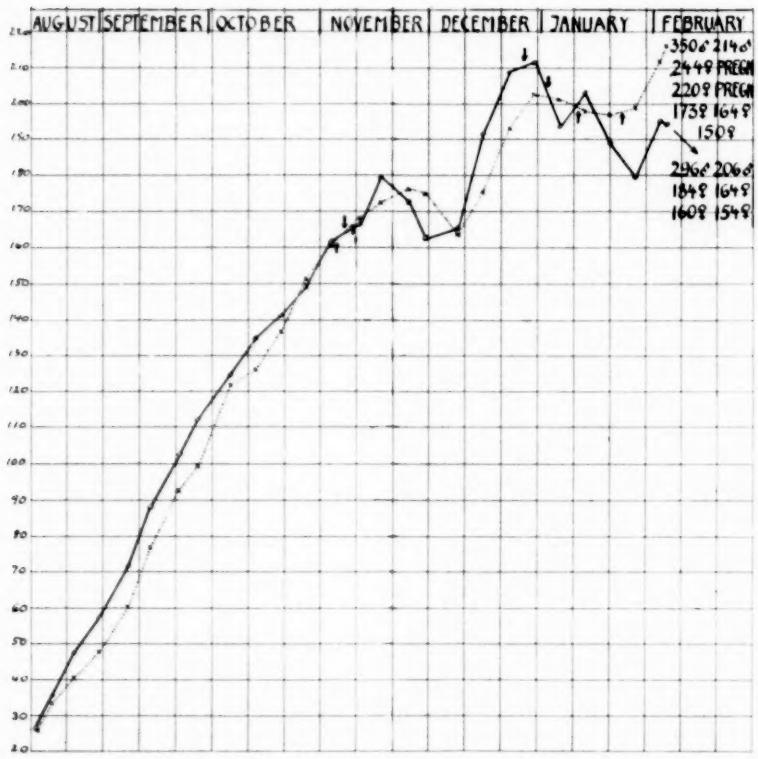

Fig. 2. — Experiment B. Average weight of rats kept in red (——) and daylight (. . . . .).

This seems to confirm the results of Ludwig and von Ries. But the evaluation of the figures is difficult owing to the repeated pregnancy in some of the animals. The superiority in weight which the red animals showed during July, is explained by the production of litters (↓) in three cases. The superiority in weight of the red animals at the end of the experiment is partly explained by pregnancy of one of these animals (discovered only on post mortem examination), and partly by the higher proportion of male animals, whose weight is always greater than that of females. Moreover, this experiment cannot be considered an established proof of the influence of red light on growth, because the animals were not pure breed, and therefore the individual differences in weight were relatively high. Under the circumstances the result is subject to accident and variation, so much so, that a series of identical results would be necessary for confirmation.

Experiment *B* carried out under similar conditions showed the opposite result: the average weight of the red rats was below that of the controls The higher weight of the controls is partly due to the pregnancy of two female rats, partly to the smaller proportion of the heavier male animals. (fig. 2).

Experiment *C* again seems to demonstrate the superiority of the red rats. But this result can exclusively be ascribed to the different sex distribution in both groups. There are 3/5 males in the red, but only 1/4 males in the control group (fig. 3).

More conclusive than the curves is table 1, which demonstrates the average body weight of the animals tabulated by sex, as well as in red and control group.

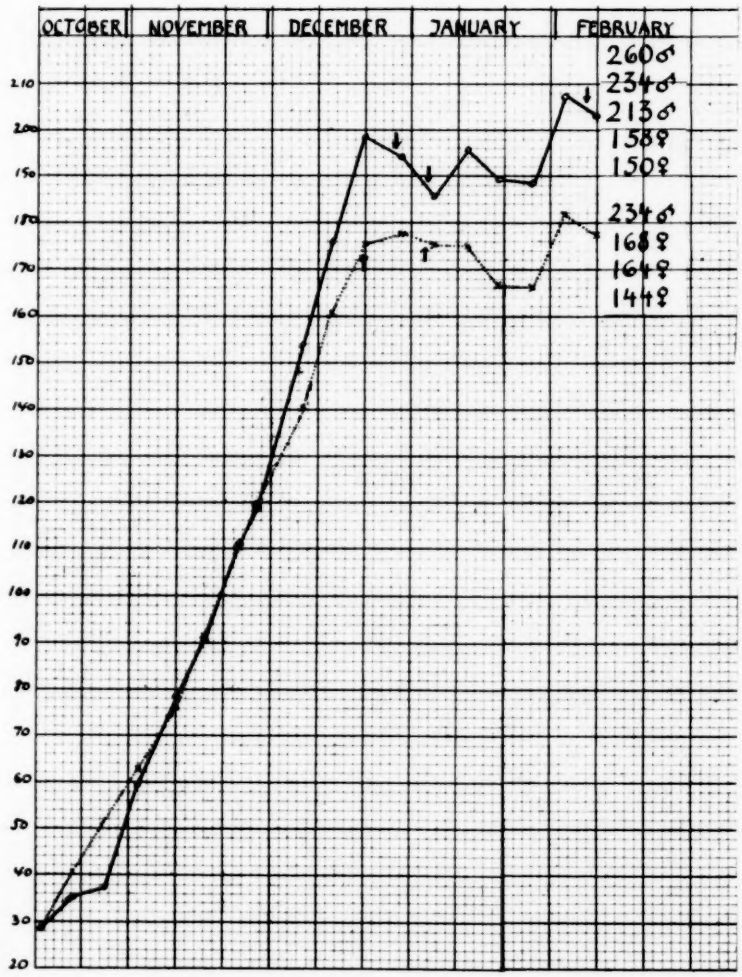

Fig. 3. — Experiment C. Average weight of rats kept in red (——) and daylight (. . . . .).

The figures of experiments B and C are in contrast with the observations of Ludwig and von Ries. Experiment A appears to be a confirmation so far as the males are concerned. But this single difference seems to be insufficient, since our animals were not of pure breed.

Calcium and phosphorus determination in the serum showed the following results (table 2):

There are some slight but inconstant differences, as for instance a lower Ca average in the serum of the red group, in the experiments B and C. This could explain the obvious excitement of the animals kept in red light as compared with the controls. It is known that workmen in photographic factories develop a marked restlessness which has been ascribed to their stay in red rooms.

The x-rays of the animals did not reveal any difference in the calcification or bone formation of both groups.

The microscopic examination† of the hypophyses, ovaries and testes did not reveal any difference between the rats kept under red light, and the controls.

† The post mortem and microscopic examination of the endocrine organs was carried out by Dr. Leo Moschokowitz (Pathological Department of Dr. Paul Klemperer), and Dr. J. H. Globus (Neuropathology).

TABLE 1. — *Studies of Average Body Weight of Animals.*

Experiment No.	RED		CONTROL	
	Male	Female	Male	Female
A	370	287 pregn.	335	258
	365	.....	330	210
	330	.....	272	.....
average	355	287	312.3	245
B	296	184	350	244 pregn.
	206	164	214	220 pregn.
	.....	160	.....	173
	.....	154	.....	164
			.....	150
average	251	165.5	282	190.2
C	260	158	234	168
	234	150	.....	164
	213	.....	.....	144
average	235.7	154	234	158.7

In contrast to the findings of Ludwig and von Ries, red light did not influence the growth of rats. Nor did the calcium and phosphorus content of the serum, the calcification of the skeleton, the post mortem findings or the histologic structure of the hypophyses, ovaries and testes show any definite difference between the rats reared under red light, and the control animals.

Experiments With Human Beings

Influence on "Tonus Reflexes."—The studies of Stein,[8] Loeb[9] and Metzger[10] have shown that optic light impulses increase the tonus of the body. The same is true of non-optic light impulses, as shown by Börnstein,[11] and later by von Hornbostel[12] and Quadfasel.[13] Due to an intermodal primeval function ("intermodale Urfunktion"—von Hornbostel) of all sense organs, "light" tones, "light" smells, "light" taste and touch qualities as well as optic light impulses increase the tonus. According to Börnstein, the skin is also able to perceive "light impulses" without the use of adequate sense organs. Evidence has been brought forth to show that the skin of amphibia, worms and insects acts like a primitive sense organ.

However, for our problem only one question is of importance; namely, whether or not the different colors of the visible spectrum have any specific effect via the skin, on muscle tonus. It does seem to hold true for the lower primitive animals. The results of Graber[14] proved that blinded worms react with phototropic photodermatic reflexes to red, and with photophobic reflexes to blue. It was Ehrenwald[6] who first made analogous experiments with human beings. He made use of the deviation reaction of the arms stretched forward. This had previously been studied by Barany,[15] Fischer,[16] Wodak,[17] Hoff and Schilder,[18] Goldstein,[19] and others. The face and neck of the experimental subject were irradiated from the side with non-monochromatic light (filtered Sollux lamp-Hanovia) which had passed through ice water, at a distance of 30-50 cm. The eyes were carefully covered. Before each experiment, and before every change of light the subject spent 5-10 minutes in the dark, or half darkness. Ehrenwald found a regular tonus reaction in 86 per cent of the subjects with whom he experimented. After 15-30 seconds the arms, stretched parallel forward, gradually deviated toward the red light, a deviation of 5-10 cm., after one minute. Discontinuance of the irradiation brought the arms back to the starting position. Irradiation

TABLE 2. — *Results of Calcium and Phosphorus Determination*

Experiment		RED Ca	RED P		CONTROL Ca	CONTROL P
A	1.	.....	....	1.	10.2	5.0
	2.	11.0	6.4	2.	.....	6.2
	3.	11.4	7.9	3.	11.5	6.2
	4.	.....	5.7	4.	11.1	....
				5.	.....	5.5
average		11.2	6.7		10.9	5.7
B	1.	8.8	....	1.	11.0	....
	2.	9.6	....	2.	9.2	....
	3.	9.2	....	3.	8.8	....
	4.	10.4	....	4.	11.8	....
	5.	9.8	....	5.	10.2	....
	6.	10.7	....	6	9.6	....
				7.	9.4	....
average		9.75	....		10.0	....
C	1.	7.2	7.2	1.	9.8	7.1
	2.	10.4	6.7	2.	9.4	6.5
	3.	.....	6.7	3.	10.0	6.6
	4.	.....	6.5	4.	.....	8.2
	5.	.....	6.3			
average		8.8	6.7		9.7	7.1

with blue light elicited an opposite tonus reaction: deviation of the arms away from the light. The deviation angle proved less with the blue than with the red, and the deflexions were more marked in children than adults. In sensory disorders of the vestibular apparatus, the tonus reflex failed to appear. In amaurotics it could be elicited. This "photodermatic tonus reflex" could not be produced from the skin of the trunk. As a result of these experiments Ehrenwald believed he had proved that the skin possesses potentiality for ray perception ("Strahlensinn" der Haut).

These experiments seem to be of primary significance. If true, they would prove a specific effect of colored light of certain wavelengths on human beings. We have tried to verify these experiments. We adhered closely to the method of Ehrenwald. The subjects were 20 adults and children who were carefully blindfolded in a dark room. They knew nothing of the nature of the experiment, or of the expected results. Before every experiment and between each change of light, they remained for five minutes in absolute darkness; conversation was avoided. In order to exclude subjective judgment, the majority of the results were observed by a second person and noted independently. Both the "Sollux-lamp" with its original filters and a special lamp, constructed by Dr. Edward Lasker, served as the source of light.

These experiments proved negative. There were some slight tonic deviations in several of the experiments, but they never exceeded the degree observed in control experiments, without specific light influence, in either a light or a dark room. In some cases, independent of the color of the light, the stretched arms diverged after a minute — most probably as a sign of fatigue. Sometimes the deviation was identical to both red and blue, and within the limits of normal tonus changes. The majority showed no deviation whatsoever. The negative results, however, do not exclude other specific, local light effects.

Effect of Red Light on Skin Manifestations. — In 1894, Finsen[20] rediscovered forgotten reports concerning the treatment of smallpox in the dark room. Clinically accepted methods for the purpose of

avoiding scar formation, such as compresses, ointments or lapis applications were explained as being effective solely by virtue of light exclusion. Permanganate applied to the affected skin, as described by Dreyer,[21] and still appreciated in the therapy of smallpox, is essentially an exclusion of light with the filter placed upon the skin itself. It was Finsen who replaced the dark room, unpleasant for both patients and nurses, with the red room. The results remained the same. The effectiveness of such a room depends on the absolute exc' ion of the chemically active light of short wavelengths. This can be achieved by the use of red window panes or by pasting filter paper or cellophane on ordinary glass panes. Certain precautions must be taken to avoid the admittance of daylight with the opening of doors leading to adjoining rooms. However, the adequacy of this arrangement has still to be proved by means of light-sensitive photographic paper or by spectroscopic methods. With these precautions properly taken, the treatment in the red room really prevents suppuration of the eruptions as well as subsequent scar formation. Precocious discontinuance of the red-treatment causes suppuration and scar formation wherever the pustules are not dried. In these observations, all authors, especially the Scandinavians, agree with one another. This is important, insofar as it is one of the very few undoubted facts in the therapeutic use of colored light.

It is evident that the red light treatment of variola is a "negative light therapy." It depends on the exclusion of chemically active light, and by no means on the specific effect of red light. Most probably light of a short wavelength aggravates certain inflammatory processes because of the formation of histamine, which in itself produces inflammation. Red filters avoid this unfavorable influence.

This does not mean, however, that irradiation of inflamed areas with a red lamp counteracts inflammation. Based on this erroneous theory many therapeutic efforts are reported in the literature of treating erysipelas, erythema solare, pemphigus, even rashes in measles and scarlet fever with red light irradiation. Though the rashes of measles and scarlet fever may become invisible in the red room, they cannot be influenced in their real intensity by red light irradiation. On the other hand, Müller,[22] Nonnenbruch[23] and many others recommended red light in the treatment of erysipelas — a procedure abandoned by other clinicians. Nevertheless, there are authors who are convinced of its efficiency. On the other hand numerous reports show the curative effect of ultraviolet in erysipelas. It is difficult to conceive that ultraviolet and red light, biologically so different, could have the same beneficial influence on the same disease. My own experience on this subject might be interpreted as good results; but in two cases of erysipelas in the newborn which could have been a clinical *experimentum crucis,* the red light treatment failed completely. It is extremely difficult to judge the results in erysipelas. To a certain extent it is possible that the exclusion of daylight may have a favorable local effect; however, red light does not have a definite influence on the outcome of the disease.

Through the courtesy of Dr. George Baehr I had the opportunity to treat a case of lupus erythematodes disseminatus in a red room for two weeks. I am not going to discuss the indefinite nature and etiology of the disease, but it is well known that the influence of light plays a certain rôle. The fever curve (fig. 4) shows a sudden drop, following the covering of the windows with red cellophane. But this is most probably only a coincidence. Further experience is desirable.

It is said that red light has a beneficial influence on urticaria. This is difficult to contradict because of the brevity of the eruptions. In a few cases of generalized toxic exanthemata, circumscribed areas, covered with red cello-

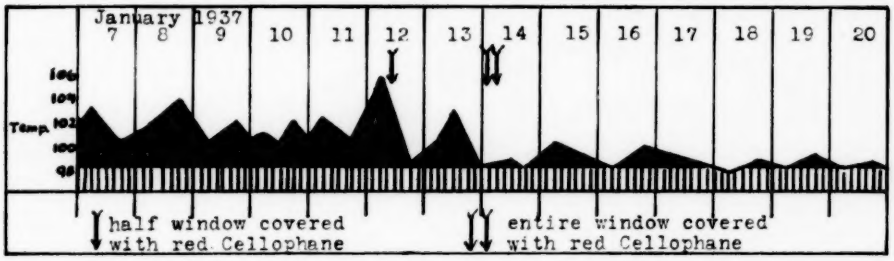

Fig. 4. — Red room treatment of lupus erythematodes disseminatus.

phane, were exposed to daylight for one day, and occasionally a fading in these areas was observed. This can be sufficiently explained, however, without assuming a specific effect of red light, by the elimination of mechanical irritation and perhaps, in addition, by the exclusion of chemically active rays.

The evaluation of therapeutic results, particularly in exanthemata and erythemas, is so difficult that only experiments carried out under clear cut conditions may lead to a conclusion. In the "Handbuch of Lichttherapie," Volk[24] says, "Acute inflammatory changes of the skin, dematitis solaris, quartz irritated skin is advantageously exposed for an hour to red light. The vesicles become dry rapidly, the wet area becomes dry within 24 hours, the skin returns to normal by desquamation, and it is pointed out that pigmentation does not take place." In order to corroborate his observations, we studied the influence of red light on the erythema produced by ultraviolet light.

Method. — The skin of the chest or the back was segmentally irradiated with the quartz lamp, through a stencil in which four identical squares, in one line, had been cut out. It is advisable not to use the forearm for such experiments, since the light sensitivity is somewhat different in the distal and proximal skin areas. Of these four areas, two were covered, the third exposed to blue light and the fourth to red light for a variable length of time. In a second group of experiments, the four skin squares, by use of a slide, were increasingly (1-5 minutes) exposed to the vertical rays of the Hanovia Alpine lamp. In immediate succession the lower or upper halves of the four squares were covered and the remaining halves irradiated with red light for one-quarter to one hour periods. In this way it was possible to study the influence of the red light on each of the four squares with their gradually increasing erythema. The irradiated areas were continuously observed for more than two weeks.

Results. — Ten experiments* were carried out with ten different persons. Except one self-experiment in which the conditions were objectionable, all presented negative results. The after-irradiation with red light did not influence either the duration or the intensity of the ultraviolet-erythema, nor did it change the pigmentation. During the period of observation, there was no perceptible difference between the upper and lower halves of the four skin squares. Nor were the subjective sensations, such as burning, pain, or itching influenced by the red light.

We also approached the question of the effect of red light from a different angle. Even if it did not influence the ultraviolet-erythema, there was still a possibility that it might prove effective on the normal uninflamed skin. On five different persons, the effect of red light was therefore examined with the capillary microscope.*

Method. — Twenty minutes red irradiation with a fotoflood bulb as source

* Dr. H. Rappaport kindly assisted in some of the experiments.
* Dr. Sidney Leader carried out these examinations.

of light, from a distance of 10 cm. The rays passed a spherical ice water bottle, and were converged by this arrangement upon the nailbed. The examination with the capillary microscope took place immediately before and after the irradiation. In experiments with children, their middle fingers were wrapped in red collophane for 24 hours and exposed to daylight or artificial light. The finger was examined before and afterward, and a comparison was made with the unexposed fingers.

Result. — In none of the experiments could any change of the capillaries be observed as a result of the red light irradiation.

Surveying these clinical and experimental results in man, we come to the following conclusion: The exclusion of chemically active rays by means of red filters can have a favorable influence on certain inflammatory skin manifestations, exanthemata and erythemas, as a result of the exclusion of secondary inflammatory irritants. This is proved definitely for variola, it is possible for erysipelas and lupus erythematodes disseminatus, but doubtful in all other skin manifestations. Essentially, this form of red light treatment is "negative light therapy." Any positive effect of the red light due to its specific wavelength — as for instance checking of inflammation — does not exist, or it could not be proved clinically or experimentally.

Limits of "Chromotherapy." — Clinicians and practitioners will ask whether this is a reason for abandoning every red light treatment as a senseless and useless therapy. They will contrast our statement with their favorable results in the treatment of colds, otitis, lymphadenitis, wounds and other diseases.

The results in these conditions are not denied. Red light treatment is simultaneously heat therapy with radiating and conducting heat. It produces hyperemia in the focus — an uncontested therapeutic factor. The question is whether the red filter put in front of the source of light or heat is an advantage. Physically, the quantity of conducted heat is somewhat diminished by the mass of the filter, and the quantity of radiating heat is reduced to the amount of the deeper penetrating red rays. When a heat effect 1-1½ cm. beneath the skin surface is desired, for instance in lymphadenitis, red light therapy is indicated. But if there is no objection against the simultaneous heat effect on the superficial skin layers, the unfiltered lamp has the identical effect, because it emits red rays with the other rays of the spectrum. On the other hand, whenever an irradiation of the deeper layers is superfluous or undesirable, as in lesions of the mucous membranes, the blue filter has its place, because it retaines the deeper penetrating rays. Presumably, there is no definite difference in the therapeutic effect of the one or the other of rays in the visible spectrum. Otherwise one can not understand why reliable physicians report good results with either in the same condition.

Undoubtedly, a psychic component must be taken into consideration in every treatment with colored light. The supposedly antispasmodic effect of red light can hardly be explained differently. Likewise, if warts disappear with blue light irradiation, it is, of course, an interesting phenomenon — but not a phenomenon of light biology.

Summary

1. A summary is given of the literature on the effect of colored light.

2. Germination of lentils is delayed, their growth is stimulated by red light. These results are considered to be phenomena of etiolation — not a specific effect of red light.

3. Guppies show a preference for blue, ants for red light; flies do not seek either blue or red light. These findings are explained by the natural preference of certain animals for daylight, semi-darkness, and darkness, respectively.

4. Red light does not influence the growth of rats, nor does it have any effect on the calcium and phosphorus content in the serum, the bone formation, or the cell structure of the hypophyses, ovaries or testes.

5. The "photodermatic tonus reflex," described by Ehrenwald as a tonus reaction to blue and red irradiation of the skin, has not been confirmed.

6. Red room treatment definitely prevents suppuration and scar formation in variola. This is a "negative light therapy" — i. e., the effect is due to the exclusion of chemically active rays, but not to the specific effect of red light.

7. A specific influence of red light in erysipelas, erythemas, exanthemata, or lupus erythematodes disseminatus has not been proved.

8. The ultraviolet erythema can not be influenced by subsequent irradiation with red light.

9. Red light irradiation does not influence the capillaries of the normal skin.

10. The limits of "chromotherapy" and its psychic component are discussed.

25 Central Park West.

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(Concluded on page 252)

PRESENT STATUS OF MASSAGE *

HANS J. BEHREND, M.D.

NEW YORK

There is scarcely a field in medicine where so many disappointing results are experienced in every day practice as in massage. Despite confirming experimental findings, the interpretation of the physiology of massage for practical purposes is somewhat confusing. The scientifically trained physician finds himself helplessly confronted with many statements as to the effects of massage. He has never had a special training for this work. Massage means to him something mysterious that is very difficult to learn, or else he considers it a species of quackery to be prescribed as a placebo.

Bettmann recently has defined massage as consisting of certain manipulations carried out on the body surface with an exact dosage in local, temporal and dynamic respect. Massage is a mechanical stimulus to the skin organ, nothing more and nothing less. Every living being reacts to external stimulation in a complicated, but regular manner. The skin organ acts as a perceptor of the stimulus and transmits it to those parts of the body with which it is in closest touch; namely, the circulatory and the nervous systems. These in turn cause all the reactions which we observe in our experimental physiologic work and which lead to the beneficial results of massage.

Mechanical Influence

These preliminary remarks are made because the expression "mechanical action" of massage is used in the literature in a different way. It is assumed that we are able to influence for instance the circulation mechanically, to alter the direction of the blood flow, or to move or remove body fluids and change their distribution. In fact we can do very little by means of massage in dissolving, resolving or removing any local pathologic products or in influencing the blood flow mechanically. If we are able to cause these to disappear, it is not due to a direct mechanical influence but to factors which will be explained below. The fact that injected India ink or dye can be moved by massage, does not prove very much. It can be moved only over a very small distance, and then the natural direction of the blood flow, too, has to be considered (Hauffe).

Pemberton mentions mechanical factors accompanying massage, but finds it incorrect to assume that the general effects on the circulation are brought about through mechanical agencies alone. "There is also a reflex influence on the blood vessels by means of the autonomic nervous system." Another authority, Mennell, also separates two possible effects of massage: — "reflex" and "mechanical". He emphasizes that the reflex action is as important as the mechanical effect. According to Mennell, the reflex action plays a role to relieve the spasm and pain of a fracture, in diseases of the nervous system, in massage of the abdomen and of the heart. The mechanical effect shows its influence on the circulation, e.g. to assist the venous return, on the lymphatics, in stretching tissues and the like. But Mennell also states that it is impossible to dissociate the mechanical from the reflex effect. "Nevertheless the mechanical action is of great and real service in treatment."

Assertions like these convey the impression that we are able to cause direct results mechanically. We must not distinguish between a mechanical

* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 21, 1937.

direct and an indirect reflex action of massage. The physiology of massage will be much easier to understand, when we use the word "reflex" exclusively. The word "mechanical" pertains to the effort by hand, the mechanical power of which unfortunately cannot be measured in figures. Therefore we can not describe exactly the strength of the stimulation applied to the skin. Any touching of the skin means a stimulus which is followed by certain reactions of the different systems of the body.

The circulatory system reacts to external stimulation in a very interesting way according to the strength of the stimulation. In a recent publication the writer has dealt with the action of hot and cold applications on the circulation. It has been demonstrated that the reactions obtained are quite different when a vigorous stimulus (extreme heat or cold) or a slowly increasing stimulus (gradually increasing temperature) is applied. Massage is a stimulus, and the blood vessels behave according to its strength.

Hauffe was able to demonstrate by means of phethysmographic curves that the deeper located blood vessels are narrowed after massaging. His phethysmographic volume curves fell after massaging, at the conclusion of which it gradually rose only to the initial point. These findings suggest that there cannot be expected an enormous improvement of the local circulation. Heretofore most investigators based their opinion of an improved circulation after massage on their examination among other factors of the capillaries and the blood pressure. As to the latter opinions vary. Some find it higher, others lower, and still others unchanged. As far as the capillaries are concerned there is general accord of opinion that there is a capillary dilatation present which has inspired the investigators to assume that the local circulation has been improved. It can, however, be easily demonstrated that the capillaries dilate very readily. After applying heat, cold, chemical or mechanical stimulation we always find the skin red and the capillaries dilated, when stimulated strongly after a primary vasoconstriction. The capillary vasodilatation gives us no information about the behavior of the deeper and larger blood vessels. According to recent investigations it is due to a physicochemical process. Whenever the body surface — the skin organ — is firmly stroked, a histamine-like substance, or possibly histamine itself, is formed (Lewis, Wright, Dale and Gaddum) and the typical histamine triple response is observed, namely local dilatation of the capillaries, increased capillary permeability, increased exudation of fluid and wheal formation, and dilatation of surrounding arterioles.

According to Wright "the protein and fluid escape from the vessels reduces the volume of the circulating fluid and throws a further load on the circulation. The red blood count per cmm. and the hemoglobin percentage consequently rise." This has been observed after massage by investigators and has been described as a favorable sign to be recommended for the treatment of the anemias. It remains to be seen whether the increased blood count and hemoglobin percentage should lead us to the conclusion (Pemberton), that "massage exerts a favorable influence on the circulation of the fluids of the body as a whole" or whether these findings will be explained differently. Wright has described that if the back of a susceptible subject is extensively stroked until a large wheal develops, flushing and rise of the temperature of the face occurs like that which follows a subcutaneous injection of 0.06 mgrm. of histamine. This proves that histamine was formed and entered the circulation.

Lampert has pictured the influence of massage on the capillaries and indicates that there is produced a substance which passes into the circulating blood. Schaudig injected intracutaneously a serum which he obtained from the muscles of the back and the limbs after fifteen minutes' massage, and was able to produce a wheal which was by 47 per cent larger than that

caused by serum taken from the blood before the massage was given. Lampert thinks it possible, when considering the publications of Lewis and others, that this substance is of a histamine nature.

Dosage

There is, thus, no doubt that massage acts on the capillaries. But a favorable influence can be obtained only if the strength of the stimulation is a correct one. Otherwise we will experience disappointing therapeutic results despite apparently favorable physiologic findings. This may explain many failures of massage treatments. Considering this measure as a producer of histamine in the circulation and the intense effect of this substance on vasodilatation, the extreme importance of dosage becomes apparent. Eppinger and Krogh have pointed out that the muscle capillaries can be opened by massage. This may account for the fact that massage is apt to produce a distinct improvement in cardiac cases.

It is important to include massage in the general armamentarium of cardiac decompensation therapy. This indication is really not new. But applying it we should not assume that we are emptying blood vessels mechanically and thereby assisting the venous return. We are able to empty small superficial veins of the skin by means of light stroking, but with this we influence the general circulation very little. To help and assist the venous return, massage alone is not sufficient as will be shown. There is always the danger present that we apply too much massage and that the deeper blood vessels respond with vasoconstriction, thereby impairing the circulation.

Pap has found that peripheral massage does not alter the blood gas values in the veins in a normal individual, nor does it increase the velocity of the circulation. The instantaneous change of the oxyhemoglobin manifest during the first minutes is a sign of vasoconstriction due to the irritation of the vessels. The stronger this irritation is, the longer will the vasoconstriction last. Great caution must therefore be exercised with certain forms of massage in vasoneurosis and neurasthenia. The tone of the blood vessels is continuously controlled by the vasomotor center, which can be influenced by many factors. According to Wright the peripheral nerves contain both depressor and pressor afferents. "By suitably selecting the type and strength of stimulation one or the other group can be brought into action." The arterial blood pressure varies as the product of the cardiac output and the peripheral resistance. The cardiac output depends on the venous return, the force and the rate of the heart (Wright). All these factors are, as Hauffe has shown, decidedly dependent on external stimulation.

The literature of massage shows a remarkable divergence of opinion so far as the behavior of the blood pressure is concerned. These findings must be different because it is very difficult if not impossible to state the strength of the massage applied. I believe that we should be able to formulate the physiology of massage in consistent and coherent sequence, from the very first stimulus. The external stimulation affects the autonomic nervous system. Due to a local axon-reflex it acts on the local blood vessels. Through the vasomotor center it influences the general circulation, acting on blood flow, blood pressure, and diuresis according to its strength. Through other nerve centers it activates the function of all the other organ-systems of the body.

Strong stimulation produces an increase, mild stimulation a decrease of these functions. Strong stimulation increases tension, mild stimulation causes relaxation and diminishes pain. This is the secret of massage. Its influence on the general metabolism can also be explained through the improvement of the circulation, which is the chief action. However, Pemberton's and his

coworkers extensive investigations have shown an absence of demonstrable changes in the chemical equilibrium of the fluid tissues, Pemberton averring that massage has no immediate or pronounced effect on the general metabolism per se. These findings lead us in some way to the disappointing conclusion that massage given alone will accomplish very little. Disappointing for all those — principally technicians — who regard it as a universal remedy.

Experience shows that massage is nearly always prescribed in combination with some other physical remedy. It has been mentioned that it is almost impossible to gage exactly the amount of massage. We, therefore, have to combine it with some other forms of stimulation of which we know that they positively cause dilatation of the peripheral circulation. "Baking and massage," "diathermy and massage," "short wave and massage," "whirlpool bath and massage" are therefore prescribed. The only trouble is that very frequently the degree of heat administered before giving massage is too intense. The patient is exposed to one strong effect followed by another. This explains many failures of massage treatments. The best medium to produce a mild stimulation is water.

In recent publications the writer has mentioned that other agents deliver the amount of their inherent heat with different speed and therefore cause quite different reactions at the same degree of temperature. The partial bath of increasing temperature therefore has been recommended to produce a true dilatation of the peripheral circulation. This recommendation also holds in combination with massage. It is only necessary to take care that the massage is not given too strong with regard to the patients capacity of reaction.

The ability to react to external stimulation is quite variable in different individuals, more so in the sick as compared with the healthy. Normal beings exposed to environmental irritation should become inured. Why then should they not be able to endure the irritation of a strong general massage. If their capacity of reaction is a normal one, they even feel invigorated after such a procedure. But very many people feel tired after massage. This is not always a favorable sign, but a sign that the threshold of their capacity of reaction has been reached very quickly. The sick are even more sensitive to stimulation of all kinds.

Last year I sounded a warning not to misuse cold showers, and I now do the same for massage in all kinds of institutions. This statement is not intended as an attack against well trained masseurs. It aims to point out their limitations. The masseur who attempts to give massage without medical supervision will do so without adequate knowledge of the capacity of the patient. Many deplorable results could be avoided if people would not ask for massage without medical advice and if the masseur would refuse these requests. I fully realize the difficulty of the situation. It will be remedied only when the physician understands the physiology of massage, knows what he can expect from it and masters its technic. The help of the technician is by no means to be abandoned, but the physician must indicate to the masseur the type and degree of massage to be administered.

Action On Muscles

A few words should be said about the action of massage on the musculature. Here we must clearly differentiate massage and exercise. Haldane, Barr and others, quoted by Pemberton, have shown that even mild exercise induces a definite systemic acidosis. Lactic acid is formed in the actively contracting muscle and this acidosis may be detected in the blood. Massage does not show evidence of acidosis characteristic for exercise, nor of alkalosis characteristic of systemic exposure to heat. Its value in treating tired muscles

of athletes is well known. Properly applied it will improve the circulation in the muscle and thereby remove the chemical substances produced by fatigue.

Musculo-physiologic research has been greatly stimulated, according to Kohlrausch, by such palpatory findings as are facilitated by massage. In a recent publication he reviews the so-called "muscular hardenings." Massage palpation permits of finding knots of the size of a pea up to a hazelnut, of a dense appearance, showing but little auto-reaction upon pressure, while large parts of the muscle are found to be of a greater tension than normal. These react to pressure by means of further increased reflex tension. The general degree of hardness is lower than that of the knots. Both forms, if not attended to, remain unchanged, even if examined at intervals of several weeks. The latter vanish either spontaneously or by force of tender vibrations and shakings right under the massaging hand and intensify their tension degree upon administration of forceful kneading and pressing. The former vanish only upon the application of forceful pressing and kneading after 5 to 20 sessions. The knots are named myogeloses (Lange), the other manifestations are regarded as hypertonic regions. These findings correspond to what has been said above; namely, that mild stimulation improves the hypertonic hardening of the muscle, strong stimulation makes it worse.

Ruhmann also describes a so-called palpation massage for diagnostic and therapeutic purposes. He demands that the first massage be very gentle, with increasing force exerted in the following sessions. There is no doubt that some muscle conditions e.g. occupational cramps, require sedation, others stimulation (Alexander). The myogeloses, or so-called fibrositic areas, have to be "broken up." The stimulation must be strong enough to produce a counterreaction comparable with protein-shock therapy. The physician purposely superimposes a strong stimulus over a chronically diseased muscle or joint to cause a fresh process of inflammation, which in turn leads to improvement. This is the only occasion where we should be permitted to talk about a mechanical action of massage. A trauma is placed over the diseased area and an inflammatory reaction is expected.

When Clark and Swenson (quoted by Pemberton) found that following massage there is an increased rate of blood flow and a change in the vessel wall which is evidenced by the "sticking" and emigration of leucocytes, this I believe to be only a sign of an inflammatory process going on and "we are not justified to conclude from this that massage is accompanied or followed by an increased interchange of substances between the blood stream and the tissue cells, with an altered and presumably improved tissue metabolism." In practice we frequently observe that these secondary inflammatory reactions go their own way and lead to an aggravation of the condition.

The question whether or not massage may prevent or cure muscle atrophy is still under investigation. Kohlrausch takes the stand that atrophy or atony symptomatic of joint injuries, can never be alleviated by massage; here only resistance exercises are of value. Pemberton saw functional muscular atrophy for instance in arthritis improve after systemic and sustained massage. Very interesting in this connection are recent studies of Chor and co-workers carried on with the grant from the Council of Physical Therapy of the American Medical Association on chemical and histologic changes in denervated skeletal muscle of the monkey and cat. He concludes that "massage and passive movements are beneficial in restoring the weight of paralyzed muscles as compared with prolonged complete rest."

Technic

As to the general technic of massage, the very ancient classification of stroking, compression and percussion is still justified and well grounded.

But the physician must deviate from general rules. When we consider the physiologic action of massage as described in the beginning, we must realize that it is absolutely immaterial which "system" of massage we use. In the course of time, different "systems" of massage have been developed. There is the Swedish massage, the palpation massage, nerve point massage and many others. The writer believes that we deal only with a good massage which is successful or a bad unsuccessful one.

For those who know how to massage, the technic is elaborated from the diagnosis and the local finding. There is no such thing as special surgical, orthopedic, medical, neurologic or vascular massage. We also should not differentiate a local and general effect, as even the mildest local stimulation causes a general counterreaction. Moreover, we should not speak of a direct and indirect action of massage. The direction in which the extremities are massaged is immaterial. Every masseur is told always to massage in the centripetal direction to promote the venous return. By the same reasoning we could maintain that we impair the arterial blood flow. Those who have massaged swellings, for instance of the ankle joint, know that these disappear when massaged in centrifugal direction, if only the stimulation applied is correct.

Massage alone — as mentioned above — frequently does not lead to the expected goal. It, therefore, has to be combined with some other applications effective in the same direction. We prefer moist applications to dry ones. Underwater massage, as recommended by Currence and others, is very valuable, because the stimulation can be gaged and the warm water enhances bodily relaxation.

The disadvantage of massage-apparatus lies in the difficulty of applying the correct amount. A light human hand is always preferable to a mechanical device, even though it is difficult to teach a student the degree of stimulation to be applied. He has to feel that himself and undoubtedly some individuals are more gifted than others. One may learn the technic of playing the piano but this alone does not make him an artist. There is only one sign which gives us a hint whether or not we massaged correctly, and that is the relief of pain. Proper massage should be painless. An exception is seen in the treatment of myogeloses or fibrositis, where we actually injure the tissues. Here a "reactive pain" will appear one to several hours after the treatment or the next day. But generally speaking, "reactive" pains should be met with caution. They prove that the massage was too strong.

A few words about the indication of massage. There is scarcely an article on massage that does not give indications ranging from flat foot, fractures, sciatica, arthritis — just to mention a few — up to constipation, heart diseases, including congestive heart failure and coronary sclerosis. There is hardly a condition, for which massage has not been recommended. The indication of massage also should be determined by its physiology.

473 West End Avenue.

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Discussion

Dr. John D. Currence (New York): The presentation of Dr. Behrend impresses me not only with his analyses of the physiological effects of massage but even more by the principle which he stresses of individualizing the massage prescription to meet the specific needs both of the disease and the patient. The way he minimized the direct mechanical influence of massage impressed me a great deal, and has given me considerable food for thought. It has always been my analysis that direct mechanical influence was a nominal factor when a general effect was desired from massage, but I have always considered it probably the major factor in most cases when prescribing massage for purely a local effect.

My experience with massage has been largely in the rheumatic field, and individualized prescriptions for progressive technic in relaxing and stretching contractures, and influencing chronic fibrous changes have been of equal or greater importance than the general circulatory and nervous effects which were desired. Dr. Behrend mentioned the reactionary effect in the presence of infection, but inasmuch as in the rheumatic field this point is so important, I feel that it is justifiable to stress it somewhat. In arthritis and chronic rheumatic disease we make it a point to check the blood sedimentation rate and filament non-filament ratio routinely before prescribing massage, in order to avoid possible exacerbations of the infection, and the dosage in both time and quality of massage and hydrotherapy is guided largely by the reactionary indications of a beginning small trial dosage on this laboratory data

Dr. Alfred B. Olsen (Battle Creek, Mich): Dr. Behrend is correct in holding that physicians should be trained in both the theory and practice of massage to enable them to prescribe it to the best advantage, and also to give any needed special directions to the operator. It is interesting to bear in mind that the hurt child goes promptly to mother for sympathy, protection and relief by her tender touch and gentle stroking of the injured part.

In addition to the skill, experience and tact of the operator, the success of this efficient type of kinesitherapy depends very largely upon a number of factors, such as age, physical development and present condition of the patient, the vigor of the application and the length of the treatment. Some get on better with a light massage for twenty to thirty minutes, while others enjoy and derive much benefit from an hour's treatment.

Massage has a very wide field of application and is now recommended by some

(*Concluded on page 245*)

ELECTROSURGICAL MANAGEMENT OF RETINAL SEPARATION *

OSCAR B. NUGENT, M.D., F.A.C.S., F.I.C.S. (GENEVA)

CHICAGO

Retinal separation for many years has been called retinal detachment, but is a misnomer. The retina does not detach from the choroid, a separation taking place between the layers of rods and cones and the outer or pigmented layers of the retina.[1] Embryologically the process is a partial reforming of the primary optic vessicle, so that "retinal separation" is more nearly correct.

Another term commonly used in connection with the treatment of this condition, is the production of adhesive chorio-retinitis. Inasmuch as the choroid is not directly involved in the mechanics of the process of retinal separation it would appear that the choroid should not be considered, but when we note the involvement of the choroid in the treatment, it seems proper to leave the terminology as originally used. It therefore seems more fitting to use the name "retinal separation" than "retinal detachment," and though the choroid is not involved in the mechanics of the process, it is directly concerned in the treatment. Therefore, the term "adhesive chorio-retinitis" is proper.

The operations now performed for the reattachment of retinal separation give the best surgical results of any operative technic yet devised. Yet there is no operation performed on the human eye today which yields such uncertain and unsatisfactory end results, both surgical and physiological. In spite of these facts, retinal separation or detachment has received nearly as much attention in the literature in the last seven years as cataract. The comparatively low percentage of cures which has been generally reported in all countries and the concentrated effort in intensive research and experimentation with relative small gain, are the best evidence that we are dealing with a difficult problem.

The average ophthalmic surgeon is accustomed to a very high percentage of good surgical results as a reward for his painstaking efforts, but in the case of retinal separation his professional ardor and zeal are much dampened when he realizes that he has only an equal chance between success and failure. It must be remembered that in a large percentage of cases of retinal separation considerable pathologic change exists in the delicate structures of the fundus, and healing is blocked by the presence of foreign substance in the tissues and the lack of normal metabolic actions.

The pathologic variation in the various eyes operated for retinal separation is one reason that there is such a difference in the operative end results. It is assumed, other things being equal, that the longer a retinal separation exists the greater the pathologic changes, hence the less chance for a cure. While these statements suggest a discouraging picture, it is indeed gratifying to observe the advances which have been made in surgical technic and the improved results which have followed.

Preoperative Care

All examinations to determine the extent of the retinal separation and definitely to locate the position of the tear or tears should be made before the patient is put to bed. He is kept on a light diet from one to five days until the retina has returned to its normal position or as near to the normal position as will take place in that time. During this period a patch is kept over each eye. If the retina has

* From the Ophthalmological Department of the Chicago Eye, Ear, Nose and Throat Hospital.
* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 8, 1936.

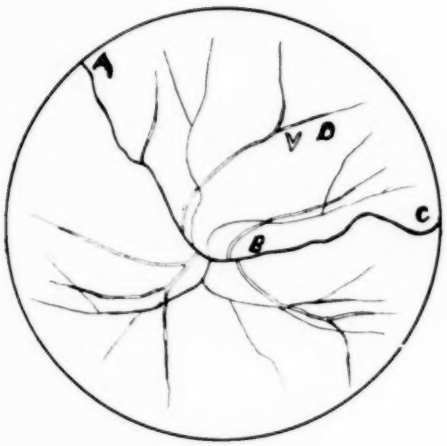

Fig. 1.

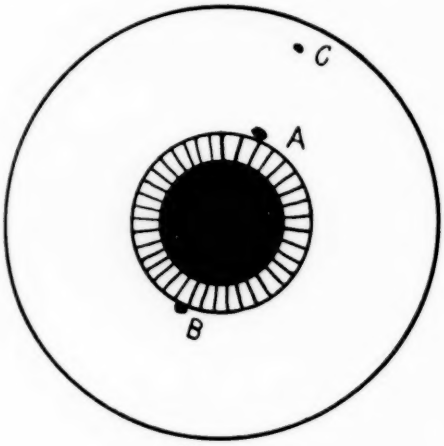

Fig. 2.

Fig. 1. — Diagrams of separated retina as seen with the ophthalmoscope. A, B, C indicate separated portion. The tear is at D.

Fig. 2. — Eosin stains are made on the sclera to mark the meridian in which the tear is to be found. A is made at the limbus, following a careful examination with the ophthalmoscope. B is placed on limbus directly across from A. The line from B to A is extended to C. This now gives a line marking the meridian in which the tear can be found.

not flattened out, it is to be concluded that nothing further can be gained from rest and that the time for operation is opportune.

In some cases the retina will either flatten out and return completely to its normal position in twenty-four hours to five days, or it may not change its position in the slightest degree. It has been my observation that a better prognosis can be given in those cases in which the retina has returned to its normal position during the first few days of rest. A one per cent solution of atropin, or a one per cent ointment of atropin is instilled in the conjunctival sac once a day during the period of rest.

If the tear in the retina has not yet been located, this is the best time to do it. Care is taken to keep the patient quiet and to locate the tear without disturbing the patient or causing any unnecessary movement of the eye (fig. 1).

The skin of the lids and surrounding area is scrubbed the night before. If there has been any difficulty in regulating the bowels during the period of absolute quiet, the patient should be given an enema the night before or early the morning of operation. A hypodermic of pantopon is administered one-half hour previous to operation.

The patient is moved to the operating table with as little disturbance as possible. The eye is especially marked to show the meridian in which the tear is to be found. This is done by touching the sclera at the limbus at either side of the cornea with a fine applicator which has been dipped in a one per cent solution of eserine (fig. 2). If this marking is correct, the surgeon will easily be guided as to the proper meridian in which to find the area on the sclera corresponding to the retinal tear.

The skin is again carefully scrubbed with soap and water. The eyelashes are cut, the skin of the lids and face is painted with a five per cent solution of tincture of iodine, and the nose and mouth are covered with a heavy operating cloth.[2] The conjunctival sac is irrigated with a 1-4000 bichloride of mercury or a 1-10000 mercuric oxycyanide solution.

Operative Technic

Analgesia. — A one per cent solution of butyn or a one-half per cent solution of pantocaine is instilled into the conjunctival sac three times. A retrobulbar injection of one cc. of a one per cent solution of novocaine or a two per cent

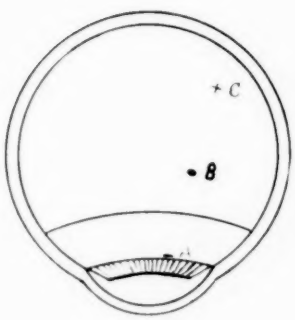

Fig. 3.

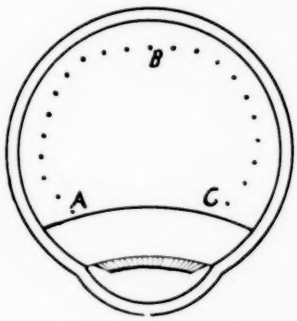

Fig. 4.

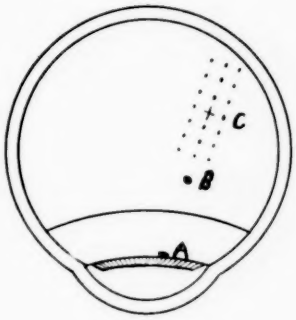

Fig. 5.

Figs. 3-4-5. — (3) Upper surface of eyeball. A and B represent the meridian containing the retinal tear. This line from A to B is extended and the point corresponding to the tear, C, is marked at the estimated distance from the limbus; (4) A-B-C represents the line of coagulation extending from A to ora serrata back to C at ora serrata, completely surrounding the area of retinal separation; (5) Author's method of placing points of coagulation to insure sealing region in meridian of tear.

solution of procaine is then made.[3] Several deep conjunctival injections of novocaine over the area of separation and over the muscles to be detached will usually give sufficient anesthesia. Cocaine solution should be employed as with it the cornea is rendered less clear for fundus inspection.

Operation. — A spring or stop speculum is used and an incision made in the conjunctiva about 10 mm. posterior to the limbus and parallel to it over the retinal separation.

Muscles should be detached or pulled to one side after being carefully freed. If the separated retina involves the posterior area of the globe, the muscle should be detached and a control suture placed in the cut tendon for better control. Walker suggests keeping the cornea pulled under the lid to preserve its clearness for ophthalmoscopic examination.

The sclera over the area of retinal separation is cleared of all tissue and with the eyeball under control and proper conjunctival retractors to produce and maintain a visible field, further measurements are made from the limbus, and the approximate point of the retinal tear is marked on the sclera (fig. 3). The process of coagulation on the choroid and pigment epithelium is then begun.

It is best when the Walker irido-platinum needles are used to place them as far back as the posterior limits of the retinal separation. They are applied uniformly at regular intervals over the entire area corresponding to the separation. A ring of coagulated punctures (fig. 4) is made entirely around the separated area from the ora serrata on one side back to the ora serrata on the other extreme of the reagion.[4]

If the sclera is thin, or if there has been a return of the retina to normal position before operation, it is best to use the small curved single micro-pins of Walked.[5] If, however, the retina is still separated or the scleral wall is normal, his regular single irido-platinum pins are employed.[6]

It is not always possible to make a minute localization of the tear, in which case I have found it best to coagulate a number of places in the area around the tear and place in the area several coagulated points with the larger needle (fig. 5). All this is done in order to be more certain of sealing the tear. These coagulating pins are placed in the sclera, not over 2 or 3 mm. apart and are removed later. Some operators use the terminal perforating electrodes.[7] Coppaz advises the use of the pyrometric electrode[8] with which the heat can be regulated.

It is my custom to use the Gradle[9] needle in difficult places far back on the sclera, for with its long curved shaft it is possible to coagulate areas of the sclera far back in places inaccessible with a needle of any other design. The use of this needle presupposes trephining of the sclera which is likely to reduce the intraocular tension.

Trephining the Sclera. — I am sure that the placing of two or three trephine openings in the sclera opposite the greatest areas of retinal separation is of great value, in that it invites better drainage of the intraretinal fluid. The Green motor-driven trephine is of service in making the openings in the sclera, for even if the intraocular tension is low the trephine openings can be successfully made.

At this stage a last look at the fundus is made with the ophthalmoscope. The retina may be back in place or it may still be separated. If it has not been restored to its normal position, it will be necessary to leave it separated and hope that the next few days will bring it back to place. This is often the case.

The muscle is now brought back and sutured to its cut tendon, either with a buried catgut suture or silk passed through the conjunctiva and tied on the outside so that it can be removed later. It is my custom to repair the conjunctiva and capsule by a running silk suture which I leave untied. This holds the conjunctiva in proper position and causes no disturbance in its removal.

Type of Current. — For several years I used conventional diathermy, but during the last two years I have employed a current with a wavelength of 5 meters and a frequency of 56,000,000 cycles. I have also discarded the indifferent electrode and allow the current to ground in the patient. By so doing, a wider area of sclera is coagulated around the puncture. This, I believe, is a decided advantage as it gives freer drainage.

I have found it necessary also to discard the milliammeter in using the short wave current and have learned to judge its strength by the rapidity with which the coagulation takes place.

Electrocoagulation for the treatment of retinal separation is, without doubt, the favorite method among the surgeons of America and Europe[10] and is applied more extensively than the Lindner or Guist-Lindner methods, although they have certain advantages and cannot be discarded. Walker prefers the Lindner method for separations near the macula.

Long standing cases of retinal separation, cases with high myopia, older cases,[11] those with vitreous opacities,[12] and after cataract extraction, are unfavorable so far as prognosis is concerned. The patient is kept in bed with absolute rest and both eyes are covered for at least two weeks after which the covering is removed. Stenopaic[13] glasses are worn for at least two months.

Summary

Single pin electrodes are used in repair of retinal separation. A barrage of coagulated points is formed in a ring-like manner surrounding the entire area of separation from the limbus on one side to the limbus on the other side of the separated retina.

An area of closely coagulated points is made surrounding each retinal tear.

Short wave high frequency currents are more effective in producing a border area of coagulation on the sclera.

The dosage is better controlled under all circumstances by discarding the milliammeter and depending upon the appearance and rapidity of the coagulation.

231 West Washington Street.

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(For discussions, see p. 227; references concluded on p. 228.)

CORRECTION OF RETINAL SEPARATION BY DIATHERMY AND CATHOLYSIS *

LUTHER C. PETER, M.D.

PHILADELPHIA

During the last four years unprecedented progress has been made in the management of retinal detachment. The thermo-puncture of Gonin, and the galvano-puncture of Vogt and others, were moderately successful when compared with earlier methods of treatment. These procedures, however, fell far short of what is now attainable by more recent technic. The chemical cauterization of Lindner and Guist brought about a higher percentage of cures, but all methods have given way to the less traumatic and more accurate treatment by diathermy and catholysis.

To diathermy are linked the names of Larsson, of Stockholm, Weve, of Utrecht, and Safar of Vienna. Catholysis is a form of electrolysis introduced by Vogt, of Zurich, and modified by von Szily.[1] Like diathermy, electrolysis is receiving marked attention since its introduction and undoubtedly will be used more frequently in certain phases of retinal detachment. At this stage of our knowledge, it is particularly of value as an aid in localizing and the closure of multiple tears, especially when small and located in or near the macula. Because of a minimum amount of trauma when from 0.5 to 2 milliamperes of current are used, many operators have begun to employ this form of electrical procedure. Its real value will be determined in the not distant future, when it will have passed beyond the experimental stage, by those who have a sufficiently large number of patients to facilitate reliable conclusions.

The technic for diathermy and for electrolysis in detachment is, as yet, in an evolutionary stage. This is especially true of catholysis. Great progress, however, has been made with both methods and certain phases are beginning to take rather definite form. It is to these phases to which attention is directed.

Localization of Tears

Too much stress cannot be placed on the accuracy of detecting and localizing retinal tears. Many plans have been devised to help the operator in locating the exact position of a tear on the sclera. Many of these methods are complicated. From my experience, the most satisfactory preoperative procedure is a careful search of the fundus with a good ophthalmoscope through a well dilated pupil. The latter is obtained by leavo-glaukosan if the usual mydriatics do not fully dilate the pupil. One should spend sufficient time in searching the fundus, in estimating the elevation of the detachment in all parts of the field, in searching for tears, disinsertions and for even minute spots of chorioditis. The meridian on which a tear is located is easily determined, and the distance, in disc diameters from the macula, can be measured with fair accuracy after a thorough study. The charts of Mr. J. Cole Marshall[2] are well adapted to accurate projection on the proper meridian and the distance in millimeters from the ora serrata. From such preliminary study a more accurate location of the tear is made on the operating table by one of two methods or both. These are transillumination through the tear, which is carefully marked on the sclera, and study with the ophthalmoscope of a preliminary hydrogen bubble produced by electrolysis, or the coagulation area formed by a micro-puncture with a needle of the Walker type. If transillumination is practiced, it should be verified either by a preliminary electrolytic puncture or by a micro-needle puncture by

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diathermy. The micro-puncture needle of the Walker type, since it is reliable, and in fact, a court of last appeal, is the most satisfactory means of determining whether the tear has been properly localized. A needle, a millimeter and a half in length, will show as a white area in the fundus about one-third the size of the disc. From this first puncture, as a rule, one can determine how near the coagulated area is to the tear; a proper barrage of needle punctures can then be placed accurately and expeditiously. Unless the tear is small, most men immediately turn to diathermy to complete the cure. If the operator provides himself with the Walker unit combining both forms of electrical energy, automatically controlled, Vogt's or v. Szily's catholysis methods may be used diagnostically, and diathermy will close the tear. Without this unit operators will find the diathermy preliminary puncture, which can be observed by an ophthalmoscope, the better of the two methods. Those, however, who undertake to treat retinal detachment by the newer surgical methods should be provided with the proper equipment to deal with each emergency which may arise in any individual case. Simplicity of technic and brevity in the actual time required for accurate localization on the operating table are important factors.

To recapitulate, the best methods for accurately locating a tear are: (1) preoperative study by means of an ophthalmoscope as described, which after a little practice becomes quite accurate and trustworthy; (2) preliminary micropuncture which can be seen with an ophthalmoscope and serves as a guide for subsequent punctures, or Vogt's catholysis method used in a similar way to locate the tear in relation to a fixed point on the sclera; (3) transillumination, which is of much value in accurately pointing the way to include the tear in a barrage of diathermy punctures.

Surgical Technic

Second in importance to proper localization is the surgical technic in treatment. This involves a number of debatable problems. Most important are, (a) anesthesia; (b) the best form of electrical agency; and (c) the best type of procedure to meet certain conditions.

Anesthesia. — Individual operators will be guided by their experience and judgment. My preference is for avertin, supplemented by vinethene, chloroform or ether. An average case, unless very simple and uncomplicated, will require from thirty minutes to one hour to complete, a period too long for ether, gas or chloroform (to say nothing of the risk of using ether in the presence of electrical sparks) when a most satisfactory and safer anesthesia can be secured with avertin. In most instances small doses of vinethene will carry the patient through for an hour without risk or discomfort, if the anesthetic is walled off from the field of operation by a wet towel.

With avertin, a retrobulbar injection of two per cent procain aids in securing local analgesia and in relieving postoperative pains. Furthermore, if cocain is omitted the corneal luster is more easily preserved for ophthalmoscopic observations with regard to the proximity of the first puncture to the tear, and the conjunctiva and capsule are preserved more naturally, rendering the dissection easier and more bloodless.

Choice of Methods. — The best technic is obtained by a combination of the methods of Weve, Larsson and Safar. The objects sought are closure of tears and proper drainage. One should avoid unnecessary trauma to the sclera, choroid and retina, hemorrhage into the vitreous, injury to the venae vorticosae, and infection.

As now practiced there is comparatively little difference between the methods of Weve and Safar. Surface coagulation by Larsson's method has much to commend it, if the coagulation points on the sclera are made with a small electrode (one-half to one mm. in diameter), and the contact period is minimal.

The modification of these methods which I am now practicing is as follows:

After the sclera is carefully exposed and dried (one or two muscles having been detached as required), the meridian of the tear is marked on the sclera at the ora serrata with a stylus selected from the Walker equipment. Careful measurements are then made from previous studies and the approximate point on the sclera is marked by the same stylus. Supplementary to these measures and transillumination, the area on the sclera is marked by gentian violet. A preliminary puncture is made with a Walker pin 1½ mm. long. The white area in the fundus is viewed by ophthalmoscopy to determine its relation to the tear. (Unless one is dealing with a bullous detachment this area is readily seen.) From this point on, closure of the tear is easily accomplished by surrounding it with micro-pins 2 mm. apart and sufficiently far from the edges of the tear to be sure that the area is well included in the coagulation areas. In addition, if the detachment is extensive, surface coagulation is practiced at intervals throughout the detached area, so as to create adhesions, especially if the detachment is of long duration. The fluid is drawn off thoroughly by a few scattered micro-punctures, care being taken that the retina is not pierced. It is unnecessary and inadvisable to perforate the retina.

When the tear is in the periphery near the ora serrata, the border of the tear toward the macula is surrounded by micro-pins, but a line of surface coagulation 3 mm. inside the ora is laid down. Only one case, in my experience, developed lens opacities in which coagulation points probably were placed too close to the ciliary body.

When the tear is in the neighborhood of the venae vorticosae, the greatest care in dissection is essential. This is accomplished by small blunt retractors. A smooth iris repositor is an ideal instrument for exposing this part of the field and the barrage of needles can me placed without harm to the vorticosae veins or to the delicate oblique muscles.

Macular tears are best approached by detaching the external rectus muscle[3] after a free canthotomy. Serving as a guide, the borders of the delicate inferior oblique can be outlined by an iris repositor, and either a needle on a curved and insulated shaft, which does not deeply penetrate the sclera, can produce the necessary coagulation points, or the less traumatic electrolytic method of Vogt or von Szily is used, if the tear is not too large. Walker[4] has employed as many as 123 needle punctures by the Vogt method in a single tear. It is doubtful whether macular vision can escape serious damage by surface coagulation, micro-puncture, or multiple catholysis punctures. If, however, macular tears are approached delicately with thin catholysis needles and the area surrounding the tear is treated by surface diathermy or by von Szily's method of surface catholysis, macular tears can be sealed and fairly good macular vision preserved. Of prime importance, however, is closure of the tear so as to prevent leakage. It is my practice to combine diathermy with small needles one-half mm. in length on a carefully insulated curved shaft, with low voltage (38 milliamperes) and fine catholysis needle punctures. Micro-puncture by the Safar method is too traumatic for this area unless it is necessary wholly to sacrifice central vision in order to close a tear. If the tear is large, points of surface coagulation will probably accomplish results with a minimum amount of damage.

Special Considerations. — Of the special surgical considerations, mention must be made of —

1. In preparation for any form of diathermy, the sclera should be well exposed and dried over the entire area to be treated.

2. One or two muscles may be detached to insure sufficient exposure.

3. In most instances, when the outer quadrants are involved or when the macula must be reached, canthotomy will aid in obtaining proper exposure.

4. Coagulation needles should remain in place until the detached area is treated, so as to preserve the tension of the eye ball. Walker needles, with silk

attached, therefore, are the best type to insure against loss or oversight of a needle.

5. To avoid infection, rigid asepsis should be employed. This should include preliminary culture studies and preoperative conjunctival therapy, as well as great care on the operating table. There should be no occasion for infection in this form of surgery.

6. In the after treatment all operators are in accord that both eyes should be bandaged and that enforced rest for two weeks is imperative. At the end of ten days, the stitches may be removed and pin hole glasses applied. Small openings in the goggles are not essential. An opening of a quarter of an inch is satisfactory and more comfortable for the patient.

7. The pupil should be well dilated with one-fourth to one-half per cent scopolamine every second day for six days, and daily, thereafter.

Factors Favorable to Recovery

Central Vision. — If the tear is not in the macula, if central vision is not much impaired, and the detachment is of short duration (a month or six weeks), central vision should be restored at least in part. Under other conditions, one should not extend to the patient prospects of complete recovery of central vision. In specific instances, circumstances may offer a poor prognosis as to central vision with, however, good prospects for reattachment of the retina and an improvement in peripheral vision.

The size and number of the tears and one's ability to close them are of first importance. At the time of operation one can determine the prognosis with a fair degree of accuracy. An operator who has worked in this field sufficiently long can determine from his findings when the operation is completed, whether the prognosis is good or has to be guarded.

The duration of the separation is most important, a detachment of six months to a year offering a good prognosis under certain conditions. If the area is not too extensive and is manifestly traumatic in origin, the prognosis is fair even at the end of a year. Beyond that time many factors enter into the possibility of recovery or failure.

The least favorable cases are those of high myopia and aphakia of long standing. Cases suffering from diabetes call for a more guarded prognosis than similar detachments in non-diabetics.

Complete detachment and those of long standing offer little hope. In the light of our present knowledge and the results thus far obtained, it is not likely that in the future separation of the retina will be allowed to go untreated. Neglect in the past was due largely to the circumstance that ophthalmologists had little to offer to these unfortunate patients. The most unfavorable factor, namely, the time element of its existence, will gradually be eliminated by the dissemination of the knowledge of what can now be accomplished in 75 to 85 per cent of cases, a percentage which will be increased with the development of better technic.

1930 Chestnut Street.

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Discussions of Papers by Drs. Oscar B. Nugent and Luther C. Peter

Dr. Walter R. Loewe (New York): Dr. Nugent gave a logical reason for changing the terminology from retinal detachment to retinal separation. He states that it is really a separation of the layers of the retina from one another, and not the detachment of the retina in toto from the choroid, and should hereafter be known as "retinal separation." Dr. Peter has placed before us an excellent historical review of the development of diathermy and catholysis in the correction of retinal separation. Catholysis will require considerable study and further demonstration of its value before it can be accepted generally as productive of permanent results. We must realize, of course, that its great advantage is the small amount of trauma entailed by its use, since only from 0.5 to 2 milliamperes are used. The aim of all procedures is to obtain the greatest amount of a re-attached functioning retina.

The essayists are correct when they state that the technic of diathermy and electrolysis is in the experimental stage. Each case is a distinct problem as far as the method of operative procedure is concerned.

One of the most important factors upon which a satisfactory end result will depend is the successful localization of the retinal tear. In most cases this is a difficult problem. Occasionally the patient comes to the operating table without the tear having been localized. When there are many teratments for a disease none is infallible. So it is with determining and localizing retinal tears, the technic of which is very complicated. Careful use of a good opthalmoscope through a well-dilated pupil is undoubtedly the best method of localization. The pupil must be well-dilated regardless of whether the operator uses leavo-glaukosan or any of the usual mydriatics. There should be no set technic to the exclusion of all others, because a combination of the methods of Weve, Larson and Safar often must be adopted in certain cases. Another important point is to carefully expose and dry the sclera and marking on it the point which is as nearly as possible over the retinal tear. Experience has shown that care must be taken not to coagulate too near the orra serrata and that coagulation too near the ciliary body sometimes produces lens opacities. Another important fact which I would like to emphasize is the placing of sutures in any muscles which have been severed. The sutures should also be placed at the point on the globe where the muscles are to be reattached at the completion of the operation. Needles should not be removed until all have been placed in situ, because the sub-retinal fluid escapes and the tension falls, making it difficult and sometimes impossible to place more needles in the sclera. I have devised a needle to fit on a hypodermic syringe for removal of sub-retinal fluid after all electrocoagulation needles have been inserted. We all agree that the least favorable cases are those of high myopia, aphakia of long standing (especially of the congenital cataract type) and those complicated by diabetes. Because of the good results which are being obtained by the methods just discussed, it is possible that retinal separation will be operated on much earlier with a higher percentage of success.

Dr. Ramon Castroviejo (New York): It seems that the two methods now in vogue which have given best results for the treatment of retinal detachment are perforating diathermy and electrolysis. The best way accurately to localize the tear is the direct observation of the fundus with the ophthalmoscope during the operation, with fully dilated pupil. This allows the observation of the electrocoagulated areas on the eyeground, and permits the accurate treatment of the retinal area where the rent is located. Arruga has devised a needle of orientation, which he introduces through the sclera at the approximate location of the rent. This needle can be seen within the eye by means of the ophthalmoscope, giving the position of the rent. After completing the treatment of the area around the needle, the needle is withdrawn, and in its place another electrocoagulation is performed. At the Institute of Ophthalmology of Columbia Presbyterian Medical Center, the electrode of Lacarrere has been used to treat retinal detachment by electrocoagulation. This electrode consists of a steel wire enclosed in a glass tube. This instrument permits the treatment of almost the whole area of the eyeball, including the posterior parts of the globe near the macula, and the optic nerve. The wire is regulated so that the penetrating of the point into the eyeball will not be excessive. The electrode may also be used to treat areas under the muscles, without the necessity of desinserting them. In cases of retinal detachment where a rent could not be found, approximately the same results as in cases where a rent is present were obtained by electrocoagulation of the whole area of the sclera corresponding to the detached area of retina. This may be a proof that the exact location of the tear is not as necessary as it was believed, because approximately the same percentage of success can be obtained by treating the whole area of the detachment than by other methods based upon the exact location of the rent. A very important point for the success of the operation in cases of retinal detachment is the drainage of the sub-retinal fluid, which allows the retina to come in contact with the traumatized choroid. Some authors have gone as far as draining the sub-retinal fluid either one day or just before the operation, in order to have the retina in place during the process of electrocoagulation. When at the end of the operation, it is seen by ophthalmoscopic observations that the retina is still detached and has no tendency to come in contact with the choroid, Arruga has advocated the injection of air into the vitreous cavity. Arruga has also

contributed a special retractor, which placed between the conjunctiva and sclera, permits a better view of the operative field and allows the instrument to reach regions of the eyeball far beyond the equator. Of the several hundred cases of retinal detachment treated at the Institute of Ophthalmology of the Medical Center, in the cases with favorable prognosis as well as those with unfavorable prognosis, the number of re-applications of the retina obtained has been approximately 50 per cent.

Dr. Mark J. Schoenberg (New York): Perhaps it would be better if I would formulate some of my own experiences under the following points:

1. A correct diagnosis and a good mental picture of the fundus are essential for the successful treatment of retinal detachments.
2. This can be done only by repeated examinations of the eye with the pupil dilated ad maximum.
3. Most of the time atropin and scopolamin are not sufficient to dilate the pupil well. An adrenalin pack accomplishes complete dilatation.
4. The patient with retinal detachment should be put to bed (preferably in a hospital) as soon as possible.
5. The operative technic is simple but everyone of its details has to be followed very minutely.
6. The after treatment begins from the very moment the operation is finished and consists of (a) placing the patient in the proper position; (b) keeping the body, especially the head, perfectly immobile; (c) prescribing sedatives in sufficient quantity to obtain a good relaxation.
7. One should not attempt to operate upon cases of retinal detachment before sufficient experience is gathered from watching those who have handled a large number of cases.

Dr. Oscar B. Nugent (closing): I wish to add something that has not yet been brought out in this discussion but was mentioned in a recent paper by Dr. Walker. He makes mention of a very important point and that is the necessity for being exceedingly careful with the electrocoagulating pins to keep them immaculate and be sure that there is no dirt on them. They should be taken care of by some one who has been especially trained for that work. If any pins are at all doubtful, it should not be used.

Dr. Walker brought out a very important point, also, in his recent paper, in his statement that it is his belief that failures have been due to the use of coagulating pins which had not been properly cleansed.

In looking back over my cases, I am inclined to believe that this statement is correct and that certain failures have been due to the use of faulty pins. This point is well worth remembering.

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THERAPEUTIC VALUE OF POSTURAL CORRECTION *

JESSE T. NICHOLSON, M.D.
and
LOUIS B. LAPLACE, M.D.

PHILADELPHIA

The general opinion prevails that a man should stand in a correct posture, head up, chin back, abdomen in and hips forward. Patients are advised that faulty posture is deleterious to good health. Yet how often do physicians fail to recognize the symptoms referable to a postural defect when they consist of something other than simple backache! What actually is the extent to which a faulty posture interferes with normal body function? This is an important question particularly in the present age when sedentary occupations are causing an ever increasing proportion of the population to develop stooped shoulders and relaxed abdominal walls in relatively early life. Abundant evidence has been accumulated in recent years to indicate that faulty posture may be responsible not only for referred pain, but for many functional visceral disorders. It is even very likely that organic disease of the viscera may have its background in a disturbed anatomic relationship occasioned by postural defects.

Postural defects as related to the vertebral column are of two types, functional and structural. Poor posture is functional when it results from disturbances affecting the supporting musculature. Common causes include general exhaustion, local conditions of the neuromuscular system (such as poliomyelitis and muscular dystrophy), occupation in a poor position, poor vision, defective hearing, chronic abdominal pain, or a rapid increase in weight (due to obesity or pregnancy). In the presence of such etiologic factors, the normal spinal curves tend to become accentuated. The line of weight bearing deviates from the bodies of the vertebrae and added strain falls on the intervertebral ligaments, causing them to stretch. Constant strain and progressive stretching in turn aggravate the postural defect.

A structural defect of posture is one which is caused by organic lesions of the vertebrae, such as disease, injury or developmental anomaly. Consideration of the value of treatment of these conditions is beyond the scope of this paper.

Anatomical and Functional Changes

Lordosis of the lumbar spine, as a rule, is accompanied by dorsal kyphosis and cervical lordosis, the one being compensatory to the other. This type of change in the curves of the vertebral column causes changes in position of the attached structures. The symptoms caused by faulty posture are usually the result of either the strain placed upon supporting ligaments, the malposition of the viscera or pressure upon nerve roots due to narrowing of the intervertebral foramina.

A faulty posture characteristically produces the following anatomic changes in the chest. The rib angles are depressed and the ribs proper assume a more oblique direction. The diameters of the chest, both transverse and anteroposterior, are decreased. The diaphragm is lowered, leaving the heart in a ptotic position, suspended by the attachment of the pericardium to the cervical fascia. These changes may be somewhat varied by differences in individual stature and by the degree of the postural defect. For example,

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in some persons a slumped posture causes the diaphragm to be raised by pressing it against the abdominal viscera. The lower ribs are thereby forced outward, the diameter of the chest is increased and the heart assumes a transverse rather than a ptotic position, particularly if the forward bending of the cervical spine is sufficient to lower the level of the suspensory cervical fascia. These variations from the usual effects of a faulty posture have been pointed out by the authors[1] and are probably responsible for the fact that a postural defect is better tolerated by some persons than by others.

In the abdominal cavity, the contained viscera normally are supported by each other due to the smaller diameter of the pelvis, and the inclination of the abdominal musculature, ilia, psoas muscles and spine to the larger diameter at the rib margins. Lordosis causes the pelvis to be tilted forward. The abdominal contents are thereby forced against the anterior abdominal wall, the muscles of which are stretched and thinned under the constant pressure. The lordosis also lowers the position of the attachments of the mesentery to the lumbar spine. The intestines and other supported structures therefore descend to a relatively lower position in the abdominal cavity.

Observations previously reported by the authors[1] indicate that in the majority of otherwise normal subjects, a slumped posture is associated with comparatively shallow and fast respiration. When the posture is corrected, the depth of respiration is increased, the rate is slowed and pulmonary ventilation is improved. This change in pulmonary function usually accompanies an increase in diaphragmatic excursion. The qualitative and quantitative results of correction seem to depend upon several factors including the degree of the postural defect and how accustomed the subject has become to it, the degree of correction and the amount of conscious physical effort required by it, and the subject's physique, whether thin or obese.

The vital capacity is considered a good test of respiratory function. The majority of subjects studied by the authors have been able to increase their vital capacity by assuming a correct posture.

Determinations of oxygen consumption have failed to reveal a definite relationship between the metabolic rate and variations in posture. We are of the opinion, however, that when a good posture is maintained without conscious effort, the metabolic rate tends to be lower (and mechanical energy thereby conserved) as compared with the faulty posture.

Although correction of posture is not always consistent in its effect on the position of the heart, its influence upon circulatory efficiency (as judged by changes in pulse rate and blood pressure) is usually beneficial. This is attributable to the fact that relaxation of the abdominal wall in the faulty posture allows an increased volume of blood to accumulate in the venous reservoirs of the abdomen and thus to diminish the blood volume. Some individuals are not able to stand steadily for ten minutes in a slumped posture without fainting.

The effect of faulty posture on the function of the abdominal viscera is difficult to analyze owing to a number of complicating extrinsic factors. Abbott[2] believes that the mean intra-abdominal pressure is not significantly altered. On the other hand, visceroptosis, which is so commonly associated with faulty posture, causes an abnormally low pressure in the upper abdomen. When the upper abdominal pressure is sufficiently below atmospheric pressure, air is drawn into the stomach during respiration. This is a common mechanism of aerophagia.

The fact that the gastrointestinal tract occupies a lower position in the abdomen when the subject stands in a faulty posture has already been mentioned. Usually this can be corrected by maintaining a proper stance, and Abbott has been able to bring about an elevation of as much as seven inches in the level of the fundus of the stomach. Abbott has also pointed out that

symptoms referable to functional disturbances can be made to disappear with postural correction even when no demonstrable change has been produced in the degree of visceroptosis. Correct posture apparently has a beneficial influence on intestinal elimination, but there is as yet no conclusive evidence to support this observation.

More theoretical and highly deserving of further investigation is the evidence as to the effect of a postural defect on the function of other intra-abdominal viscera. Goldthwait[3] observes that a faulty posture causes the liver to rotate anteriorly and to the right. Traction is thereby exerted on the common duct and in some cases this is believed seriously to interfere with biliary drainage. Ptosis of the kidneys, especially the left kidney, results in traction on the renal veins. This may conceivably obstruct the venous outflow and thus produce a sufficient degree of passive congestion to account for many of the instances of orthostatic albuminuria which occur in persons with marked lordosis. The pelvic organs are likewise affected. The ovaries share in the general visceroptosis with consequent likelihood of interference with their function. Acute anteflexion of the uterus may result from the tilting forward of the pelvis and the added weight of the ptosed viscera. Varicosities of the lower bowel and various genital disorders are possible sequela if the venous blood flow is thereby impaired.

Postural Correction

Most physicians think of postural correction chiefly as treatment of round shoulders and sway backs which are associated with a greater or lesser degree of kypho-lordosis of the dorsolumbar spine. The pain in such cases has its origin in fatigue of the muscles and strain on the ligaments which maintain the erect position of the vertebral column. The more pronounced the abnormal curvature of the spine, the greater becomes the mechanical disadvantage to which the supporting structures are subjected, so that the process is a vicious circle. In addition to fatigue and strain, there is involved also a secondary factor. Constant stretch causes small tears of the ligamentous attachments. This results in a series of subperiosteal hemorrhages with later calcification and the development of exostoses which may become extremely painful with additional strain and ligamentous tears. Arthritis of this type may occur in any joint which is subject to prolonged strain, and is particuluarly common in the spine. Postural correction is indicated not only for the relief of symptoms but as a prophylactic against hypertrophic arthritis of the spine.

Less frequently recognized because it tends to simulate visceral disease is the type of pain which was termed intercostal neuralgia by Carnett.[4] It is caused by narrowing of the intervertebral foramina with consequent pressure upon nerve roots. In the cervical spine, especially in the presence of hypertrophic changes, the condition frequently gives pain referred about the shoulders and down the arms. This even in absence of circulatory disturbance has been mistaken for angina pectoris. The recognition of this pseudo-angina and its cure by postural correction can save many individuals from a life of fear and invalidism. Similar neuralgic pains in the chest wall are often mistaken for pleurisy, pleural adhesions or pulmonary lesions. In the abdomen, narrowing of the intervertebral foramina may cause severe pain which has a segmental distribution and can be evidenced in the skin, muscle or parietal peritoneum. It is usually misleading as to its origin, as it suggests the presence of some intra-abdominal disorder. A number of cases are recorded in which two or more surgical procedures were carried out before the true cause of the pain was determined.[5] A few had undergone cholecystectomy, appendectomy and hysterectomy as well as some suspensory operation. These patients continued to have abdominal pain until their postural

fault was corrected. Carnett emphasized that intercostal pain is often accentuated by an upper respiratory infection. In such cases pain appearing in the abdomen at the onset of the illness distracted attention from the true nature of the disorder and a futile operation was performed because the surgeon was unable to differentiate between parietal and visceral pain.

Correction of a postural defect is indicated not only for the relief of symptoms directly referable to the vertebral column, but for the treatment of numerous visceral disorders as well. It is upon the latter field that we wish to lay particular emphasis, for in the past it has received only scant recognition.

Postural correction may prove extremely useful in the treatment of certain pulmonary conditions. Kountz and Alexander[6] have demonstrated that in cases of emphysema the respiratory difficulty is due largely to the low position of the diaphragm (associated with the higher intrathoracic pressure) which limits diaphragmatic excursions. They found that dyspnea was greatly relieved on raising the diaphragm by means af appropriate supportive apparatus and thus increasing the extent ot diaphragmatic movements. When lumbar lordosis is present, a comparable effect can be obtained by using postural correction as a means of raising the diaphragm. Indeed even in normal individuals the increase in the depth of respiration and in pulmonary ventilation occasioned by a corrected posture appears to be a worth while prophylactic measure against infection and degenerative change in the lungs.

Faulty posture may either simulate heart disease in a person whose heart is normal, or it may aggravate the symptoms of heart disease. As previously pointed out, circulatory efficiency is usually impaired to a greater or lesser degree by a postural defect. In extreme cases this may be sufficient to produce a marked fall of blood pressure and loss of consciousness presumably because of general muscular relaxation with pooling of blood in the venous reservoirs, especially of the abdomen. More frequently it causes only dyspnea and weakness often accompanied by palpitation. In other cases precordial pain is the outstanding manifestation and closely resembles angina pectoris. For this reason many persons are believed to have heart disease when in reality they are perfectly healthy individuals whose circulatory symptoms are the result of a faulty posture. Such cases may be "cured" by proper corrective treatment. But even when heart disease is actually present the symptoms may be at least partly due to an incidental faulty posture. It is not uncommon for a cardiac patient to try to "spare himself" by habitual relaxation of the spinal muscles and thus to develop a marked stoop. This tends to aggravate his initial cardiac symptoms. Striking benefit is obtained in many of these cases, particularly in the relief of dyspnea and precordial pain, by establishing a more erect posture.

The value of correcting a postural defect in the management of patients who present gastrointestinal symptoms has been emphasized by Abbott[2] and others.[3] It has already been mentioned that aerophagia is commonly caused by a relatively low pressure in the upper abdomen. This annoying symptom often disappears completely with assumption of good posture which elevates the stomach. Abbott believes that duodenal stasis is commonly attributable to increased tension on the superior mesenteric vessels by a dependent position of the small intestine. In 65 per cent of his cases evidence of duodenal obstruction disappeared when faulty posture was corrected. In 75 per cent of cases presenting fluoroscopic evidence of visceroptosis with accompanying gastric distress, nausea and abdominal pain were relieved by the same treatment. It is remarkable, however, that most of the latter cases were benefited even in the absence of any objective evidence that the level of the viscera had been raised. How to account for these results is entirely

speculative. Possibly they are due simply to an improvement in general body function. It is, of course, conceivable that the "cure" is entirely psychological. Whatever the explanation, the fact remains that many patients, often invalids for years, may be completely relieved, their constipation corrected and their weight increased by correction of a postural defect.

Postural correction should be borne in mind in a number of other disorders in which it is frequently overlooked. Important among these are menstrual disturbances, anteflexion of the uterus, pelvic congestion, varicose veins and the presence of long-standing symptoms referable to the liver and kidney in which the etiologic factor is obscure. Organic diseases, of course, should always be excluded before attributing the condition to faulty posture, even when this is of marked degree. Greater care, however, in noting the presence of lordosis and in instituting proper measures to relieve it will be rewarded by a surprising number of good results among that unfortunate group of patients, the obscurity and persistence of whose symptoms are the perpetual exasperation of the practitioner.

It is beyond the scope of this paper to discuss the various exercises and mechanical supports used in the correction of faulty posture since they are well described elsewhere. Comment is deserved in passing, however, by certain factors which contribute to the development of a postural defect and should be relieved, if possible, in order to obtain the best results. Important among these is obesity. Kerr and Lagen[6] have described the production of cardiovascular symptoms attending the protruberant abdomen of middle life. This condition should be avoided by proper diet and correction by postural measures. Defective eyesight and hearing often cause the subject to maintain a forward thrust of the head and shoulders resulting in kyphosis and compensatory lordosis. Very common yet seldom recognized is the occupational factor. This is especially significant among persons who sit all day at desks or tables, particularly if the lighting is poor or the table too low. Stoll[7] has reported the relief of precordial pain almost indistinguishable from angina pectoris by instructing the patient to sit straighter at his desk. Seemingly trivial details of this character are often the determining factor in successful treatment.

Summary

The symtomatology of faulty posture and the value of corrective treatment deserve wider recognition. Faulty posture is responsible for many cases of backache and intercostal neuralgia. The latter frequently mimics angina pectoris and visceral disease and failure to diagnose it has led to much futile treatment, both medical and surgical. Correction of posture is of definite value to cardiac, respiratory and digestive function and there is evidence that in certain conditions it is also helpful in the treatment of organic disease. The fact that symptomatic improvement is obtained in many cases in which objective evidence of its mechanism is lacking, emphasizes the need for further careful study of this comparatively unexploited field of therapy.

1900 Rittenhouse Square.

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MULTIPLE NEEDLE OUTFIT FOR HISTAMINE TEST OF PERIPHERAL CIRCULATION

DAVID H. KLING, M.D.

LOS ANGELES

The systematic studies of I. Starr, Jr. (J. A. M. A., 90:209, 1928) have proved that the cutaneous application of histamine is a simple and valuable aid for the differential diagnosis and prognosis of the peripheral circulation. The test is carried out by placing one drop of a 1:1000 solution of histamine at different levels of the lower or upper extremities. The skin is pierced seven times through the histamine with a needle. The normal response of the peripheral circulation consists in the development within five minutes of a wheal surrounded by a flare. Delay or absence of either flare or wheal indicate the kind and severity of the lesion of the peripheral circulation. In order to diminish the inconvenience of repeatedly piercing the skin, I have used the needle holder illustrated in figure 1. The holder is made of bakelite

Fig. 1. — Holder with multiple needles and convenient outfit for histamine test.

into which seven needles are fitted. It is sterilized by immersion in a tube filled with an antiseptic solution. Mounted on the same disc is also a drop bottle which contains a solution of 1:1000 histamine in one-half per cent chloretone.

The main purpose of this outfit is to save discomfort to the patient by applying the necessary needle pricks simultaneously. On the other hand, it is an advantage to the physician to have the necessary ingredients readily available and sterile.

1052 West 6th Street.

TRANSURETHRAL RESECTION *

JOSEPH A. HYAMS, M.D., F.A.C.S.

NEW YORK

Transurethral resection, one of the most outstanding contributions to present day urology, is not new in thought. It is the consummation of a dream of centuries and has only been made possible by the development of electrosurgical measures and their application to the transurethral removal of obstructive lesions at the vesical neck and prostatic urethra.

The earliest known cause of obstruction was the enlarged prostate, but it remained for Guthrie, Thompson, Mercier and others, in the early part of the last century, to describe bars and obstructing lobes at the vesical neck. Their instruments for the treatment of these obstructions, though ingenious, were not very efficacious. Later, Bottini's galvanocautery with its various modifications, presented a more practical response to the problem.

During the ensuing years, Albarran, Guyon and others laid the foundation for our present knowledge of obstructive pathology at the vesical neck. With a greater knowledge and understanding of the gross and histopathologic changes and further development of the cystoscope, it was found that obstruction was not due solely to simple enlargement of the prostate, but that bars, hypertrophic and subtrigonal enlargement, carcinoma, and the like were causative factors. With improved operative technic the removal of the enlarged prostate by both the suprapubic and perineal route was standardized. In fact prostatectomy was so perfected that about fifteen years ago, the statement was made that no further improvement was on the horizon. However, due to the age and asthenia of the prostatic patient, there was an irreducible mortality which stimulated progressive urologists to constantly seek a method whereby obstructive changes at the vesical neck could be removed by less radical means. In 1909, Young, with his punch, paved the way for transurethral resection by the removal of bar-like fibrous obstructions. Caulk's modification of this instrument increased its scope and by the addition of a cautery attachment, made it possible to attack the enlarged prostate more successfully. Ten years ago, Stern developed electrodes for cutting and coagulating in combination with his resectoscope. Davis, Braasch, Day, Bumpus, Thompson and others have also made valuable contributions to the transurethral removal of vesical neck obstructions. While the method of Caulk has its advocates and simple endoscopic tubular instruments are extensively used, in the hands of many urologists the most practical and effective method today, regardless of the obstruction, is that of McCarthy with his epoch-making foreoblique telescope in combination with his electrotome.

What is transurethral resection? It is the removal per urethram of obstructive tissue at the vesical neck under vision by means of a special high frequency cutting and coagulating current. Despite the many thousands of patients operated by this method, there still seems to be considerable variance of opinion concerning its value. However, an adequate number of cases has been successfully treated by this method and a sufficient period of time has elapsed since its inception properly to estimate its value and to determine its field of application in relationship to prostatic surgery.

It must be conceded that every type of enlargement of the prostate is not amenable to operative intervention nor that any one method will cure every

* From the Department of Urology, New York Post-Graduate Medical School and Hospital, Columbia University.

* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 11, 1936.

type of obstruction. Enormous enlargement of the prostate may occur without interference with the flow of urine, and obstruction when present, is due rather to specific areas of enlargement of the lobes than to enlargement of the whole gland. This was clearly demonstrated some years ago in our work on prefibrosis at the vesical neck wherein by removal of tissue from the posterior vesical lip with the McCarthy visualized punch it was shown that it was the removal of a specific area of obstructing tissue rather than a large amount which gave best results. In some instances, the removal of relatively small pieces of tissue was sufficient to cause complete restoration of function. It is evident that if by resection we can remove the obstruction with less operative risk and morbidity than by prostatectomy, it must be the better procedure.

Many urologists who today are utilizing this method extensively, at first emphasized its limitations. We feel that the selection of cases must depend on the training and ability of the operator, and with greater experience the more difficult cases will be treated successfully. Though any type of enlargement is amenable to resection where instrumentation is at all possible, we do not feel it indicated where preliminary instrumentation is not tolerated and causes marked bleeding, or where subtrigonal enlargement or marked intravesical lipping is present. Nor is it indicated in the presence of a very large prostate as a one stage procedure where the strain of prolonged instrumentation is not warranted. My last hundred cases treated by resection embrace all types of enlargements, eight median bars and fourteen cases of carcinoma of the prostate. This group is of particular interest in that the patients were operated with high frequency generators of three different manufactures, in four institutions with assistants ranging from the most highly trained to those who had no previous knowledge of resection.

Pre- and Operative Procedures

It is advisable here to emphasize that resection is not a minor procedure. Satisfactory results depend on precise localization and proper evaluation of the obstruction, experience of the operator and meticulous postoperative care. With so exact a procedure as resection, preliminary visualization of the enlargement is not only essential, but the relation of the intruding lobes to the vesical neck and urinary bladder as a whole must be estimated. I feel that cystourethroscopic examination should be augmented by urethrocystography and cystometry. I have used these methods routinely in conjunction with rectal palpation, estimation of residual urine, and the like. By proper utilization of available diagnostic measures, not only can the exact degree of obstruction be estimated but neurogenous lesions and other complicating factors which militate against satisfactory results can be determined, and a decision made as to the type of operation to be performed, prostatectomy or resection. A careful physical examination and investigation of the cardiovascular and respiratory systems and renal function tests should be carried out, as well as typing, coagulation and bleeding time estimated, and where indicated, urographic studies of the upper urinary tract.

In this series the ages varied from thirty-one to eighty-seven; the average being sixty-three, the greatest number lying between sixty-one and seventy. In some, the age and general physical impairment was such that even cystotomy was felt to be too drastic a procedure. In these, transurethral operation under caudal and trans-sacral analgesia was performed and not attended by any untoward results. Urinary disturbance was constant, as was difficulty, alteration and diminution of the stream. Hematuria as an initial symptom was more frequent in those with enlargement than with carcinoma of the prostate. Twenty-five per cent of these patients had complete retention of urine. The bladder, prostate and posterior urethra were frequently infected.

The need for preoperative treatment by decompression with the indwelling

catheter depends entirely on the physical condition of the patient, the type of enlargement and the associated pathology. The majority can and should be resected as soon after admission to the hospital as their exact status is determined. It is manifest that patients with a high degree of retention and extremely large amounts of infected residual urine should receive the benefit of the indwelling catheter and if necessary, a preliminary cystotomy. As an aid to the rapid elimination of infection in the bladder prior to resection, we have used continuous irrigation with the modified tidal irrigation apparatus of Longacre with very satisfactory results. Seven patients in this series, who had large vesical calculi or other complications were subjected to cystotomy. In the relatively few patients with such enormous prostates that cystotomy is considered necessary, I feel that the two-stage prostatectomy offers distinct advantages over combined cystotomy and resection, or even multiple resections. Preliminary ligation of the vasa was not required.

Caudal and trans-sacral anesthesia were first used, but low spinal anesthesia has proven so satisfactory that it is now routinely used.

There are two types of cutting machine in use, the tube and the spark gap. Both were used in conjunction with the McCarthy electrotome with equal satisfaction. The resectoscope provides complete visual control of canalization and exact hemostasis. Each cut can be followed as the loop first engages the tissue and is drawn toward the operator. It is essential that preliminary to and during the cutting, a full flow of water enters the bladder to avoid injury. The middle lobe, if enlarged, is first attacked in the midline. Excisions are then made on either side until the elevation is entirely removed. The lateral lobes are attacked in a similar manner, first one and then the other as far forward as the verumontanum which must be protected at all times. If the anterior lobe is enlarged, all obstructive tissue on the roof should be removed. If vision is obscured by bleeding, the vessels are coagulated before the operator proceeds with the resection. Final inspection of the urethra should reveal a conization rather than a tubular canalization. All tabs and fragments of tissue must be removed so that a smooth surface remains. When careful inspection shows that all bleeding areas have been controlled and the bladder is free of fragments of tissue or clots, a soft rubber whistle tipped catheter, 23-24 French, is inserted into the bladder and fixed in place. The return through the catheter at this time should show only a faint tinge of blood. The patient is removed to bed, the catheter immediately connected to the Drummond apparatus and irrigations of the bladder with normal saline solution carried out every ten minutes although longer intervals are permissible if there is no evidence of bleeding. This simple apparatus with its closed circuit, prevents contamination of the bladder, tends to lessen the formation of clots and simplifies the postoperative care.

Postoperative Care

The postoperative care of resection cases is as important as the actual operation and neglect of some detail may offset the skill of the operator. Despite the perfection of mechanical measures, the successful results depend on painstaking care and watchfulness of the patient by an attendant especially trained for this work. Any interference with the free flow of fluid to and from the bladder must be corrected immediately. Even when the greatest care has been exercised, a clot may block the catheter. When this occurs, it must be removed at once to prevent the formation of more clots which may distend the bladder and provoke further bleeding.

Undue bleeding occurred in only a small number of patients; that within twenty-four hours was controlled by removal of the clots and coagulation of the bleeding areas through the cystourethroscope. In the rare instance, where coagulation does not suffice, early cystotomy should be performed, as delay in

these cases is dangerous. In three patients of this series, bleeding was of sufficient severity to necessitate cystotomy. In one, a very large prostate was removed at the time the bladder was opened, and in the other two, packing through the open bladder proved adequate. Such delayed bleeding as has occurred has been of little consequence. No marked infection was present in any. Its prevention is based on gentleness in technic, avoiding undue or prolonged instrumentation and by observing careful asepsis throughout the entire course of treatment.

The average stay of these patients in the hospital from the date of admission to discharge was eleven and five tenths days. Two deaths occurred: one due to cerebral hemorrhage in a very obese individual with severe myocarditis, the other to postoperative parotitis. Three of my earlier cases have returned for re-operation, but whether ascribable to incomplete removal of tissue or regrowth, is difficult to say. However, though an occasional recurrence may take place, a second resection incurs even less risk than the first.

In the final analysis, patients who have had resection may be classified clinically as —

1. Those who have clear urine and are free of urinary disturbance.
2. Those with cloudy urine, but free of urinary disturbance.
3. Those with infected urine and urinary disturbance.

The third group represents a minority and will as a rule respond to further treatment. The inexperienced operator, however, may blame the procedure for unsatisfactory results. Persistence of symptoms may be due to insult to the urethra by rough or prolonged instrumentation or failure to use a suitably sized resectoscope, 24 instead of 28 French, where indicated; removal of insufficient tissue, or over-coagulation with subsequent formation of scar tissue. It is apparent that with fibrous median bar and hypertrophy of the prostate, there is frequently an antecedent infection of the urethra, prostate and glandular adnexa or other associated infection for which resection *per se* is not a cure.

For malignancy of the prostate with obstruction, resection offers relief and restoration of function without resorting to permanent suprapubic drainage with its attendant discomfort. Two patients in this group, relieved by resection, had generalized metastases and were so markedly asthenic that a cystotomy was felt to be too great a risk. Two others had carcinoma of the bladder as well as of the prostate, and in these, the obstruction and the growth were both treated by transurethral resection. In no instance was operation attended by complications. In this group, conditions other than obstruction were treated, among which were a urethro-vesical fistula traversing the right lateral lobe of the prostate, removal of small lobes and excresences of tissue remaining after prostatectomy.

In conclusion, a careful follow-up of many hundreds of patients after prostatectomy and resection, of which actual drawings were made, has convinced the writer of the benefit of the latter procedure. The relatively short period of hospitalization as compared to prostatectomy, a milder convalescence, the low mortality and morbidity incidence, have already made an impression on the practitioner and the laity. If, for no other reason, it induces the individual of advancing years to seek relief before terminal changes are manifest, it has value; but its greater worth lies in the promise of a less radical remedy for one of the major disorders of senescence.

78 East 79th Street.

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ARCHIVES of PHYSICAL THERAPY
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.·. EDITORIALS .·.

CHROMOTHERAPY AND QUACKERY

Since time immemorial alongside of scientific facts, superstitions and vagaries have never lacked in wide acceptance as truth. Not all vagaries in medicine, however, should be ascribed to intellectual dishonesty or ulterior motives, for it has happened again and again that well-meaning though misguided enthusiasts in the profession have clung to ineffective remedial measures in the conviction that they have accomplished much good in therapy. Unfortunately the good names of such physicians or surgeons have been taken advantage of by unscrupulous individuals for exploitation, because they found it easier to sell the offals of medicine without having to go to the trouble of ascertaining whether their goods are worth the price they ask. In the history of medical aberrations we know of no subject, theme or idea that has brought about more brazen and weirder claims for therapeutic value than the utilization of colored window panes or pieces of glass, through which ordinary light is supposed to be filtered and metamorphosed into an agent of miraculous healing power. The name freely used for this incredible piece of charlatanry is — chromotherapy.

It was not many years ago that the Russian army medical officer Minin publicized therapeutic virtues of simple blue incandescent light bulbs in a series of articles which appeared both in Russia and abroad. Minin's high rank in the Imperial army was perhaps the principal reason why his claims were accepted without question in many quarters until repeated clinical failures exposed the complete quackery of the practice. The most charitable deduction is that Minin was ignorant rather than deliberately dishonest, for it is easy to come to erroneous conclusions by a *post hoc ergo propter hoc* reasoning. One should appreciate that improvement of an imaginary condition in psychologically affected individuals or amelioration of vague phenomena commonly referred to as neuroses produced by any remedial agent, no matter how irrational it may be, will be accepted by their sponsors as proof positive of their therapeutic efficiency.

In this respect we are in accord with Haggard,[1] who asserted that "the most persistent error in the field of medicine is complacency — the tendency to accept the prevailing belief." This author properly shows that the false basic concepts that have dominated medicine have their origin in the medieval belief in the supernatural cause of disease, a fallacy which apparently many individuals have proved incapable of discarding to this very day. Likewise every modern physician must agree with Langdon-Brown[2] that conclusive clinical evidence is difficult of attainment partly owing to the tendency to accept evidence pleasing to our prejudices. That this is often true is evidenced by the reported attacks against any new idea, no matter how logical and substantiated it may be, if the underlying theory does not happen to coincide with the preconceived notions of the opponents.

Reverting to chromotherapy, every ethical member of the medical profession would be shocked were he to see the brazen and fantastic claims made for it by self-appointed exponents of this twilight zone of therapy. Cultists have been promised a veritable gold mine in the utilization of colored pieces of glass, of the shades of which we abstract from the printed matter before us the following few: flame red, spinach green, etheric blue, tangerine (not the fruit,

be it understood), love-bird green (??!), pansy (sex or flower?), cobalt blue violet, and others of the same "shadiness." If this is not enough to convince any one that Barnum was right when he said that a fool is born every minute, it surely will suffice if we glance at a few of the therapeutic properties claimed by pseudo-medical harlequins in this circus. There is according to them hardly a disease that cannot be cured by exposure to one or the other of the window panes of pleasing colors above exemplified. Thus some colors are either anabolic, metabolic or katabolic, but not parabolic because it is cheaper to make straight than curved pieces of glass. Again some are caustic (not in the sense of irony, we presume) while others are gentle, still others can cause "festers" or even kill germs. Certain colors are claimed to be helpful in enabling a tottering dotard to regain sexual potency, while others have the opposite effect, namely of subduing excessive erectility. Even a child harboring worms in its intestinal canal no longer has need of a vermifuge, for it suffices to place a certain colored pieces of glass over the child's abdomen to cause the worms to be so humiliated at the unworthy treatment accorded them that they will emigrate in a huff. Or else it may be that the worms in spite of "spinach green" feel that they cannot compete with Popeye, the sailor man.

Under such sad conditions it is a distinct service to science that a recognized investigator has attempted to approach the problem of the influence of colors in biology without prejudice and with the aim to obtain facts by experimental methods which leave no room for misinterpretation. Elsewhere in this issue Vollmer[3] has shown that much ado has been made about some facts demonstrated in plant and lower animal life, which are without significance in the higher organisms so far as any therapeutic effect is concerned. While admitting the validity of certain effects of color upon germination of plants, the growth of rats, and the preference of certain colors by ants, lice or flies, the only tangible observation made in higher organisms is a limited effectiveness on some inflammatory processes. But here no proof of therapeutic superiority over classic methods has been secured. It is therefore astonishing that so much attention has been paid to chromotherapy when more effective, expeditious, nay even specific effects are attainable by exact methods. It seems logical, that if any virtue in color therapy is to be established at all, it would be only by a method of procedure which absolutely excludes the infra-red rays, which evidently are associated with any type of light transmitted through colored glass, and most likely are the real factor responsible for the phenomena observed in certain biologic strata. Until it will be clearly shown by any of the exact methods that there is an intrinsic value in any one of the basic colors, it can only be assumed that any reported effects in the treatment of disease are either suggestive in nature or purely coincidental. Meanwhile chromotherapy will continue to be exploited by charlatans and shunned by legitimate practitioners of medicine.

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IMPORTANT NEWS REGARDING THE ANNUAL CONVENTION

An announcement of special interest is the fact that the American Congress of Physical Therapy and the American Occupational Therapy Association have combined forces for their annual sessions. The meetings will be held during the same period, September 12, 13, 14, and 15, 1938, at the Palmer House, Chicago, Illinois.

The interrelationship of physical therapy and occupational therapy has been obvious for a long time. The two fields have much in common, and, it is believed by both executive bodies, that a combined gathering of this kind will prove to be of mutual advantage.

The plan is to present distinct programs during the four days with a joint scientific program on September 14th. Problems common to both organizations will be discussed and plans outlined for further development and progress. The annual banquets will be held as a combined event.

This newer development in the procedure of the 17th annual convention of the Congress speaks for an increased attendance. With the instruction seminar which will precede the convention, and numerous other special features now being arranged, there is every indication that Chicago will be the center for large medical delegations from all over the world.

Applications for the instruction seminar are now being received daily. The interest in this undertaking is such that the committee is certain that registrations will have to be closed long before September. If you plan to enroll for this course, please communicate with the central office of the Congress immediately.

Applications for space reservations for scientific exhibits are also invited. We have ample accommodations for small or large exhibits in physical therapy or allied fields. The committee will cooperate with teaching institutions, hospitals or individuals in bringing scientific exhibits to Chicago for the combined meeting of the Congress and the Occupational Therapy Association.

For any further details address the American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago.

Closing Date for Registration of Junior Physical Therapy Technicians

After January 1, 1940, applications will no longer be accepted for Junior Physical Therapy Technicians. Information regarding registration under this classification may be obtained by writing to the Registrar, American Registry of Physical Therapy Technicians, 30 North Michigan Avenue, Chicago, Illinois.

SCIENCE, NEWS, COMMENTS

Pacific Physical Therapy Association Meeting

The regular March Meeting of the Pacific Physical Therapy Association was held March 23, in the Los Angeles County Medical Association Building, and the following program was presented:

1. Super-Voltage Installations as Applied to Physical Therapy, *Arthur H. Warner*, Ph.D.; 2. New Short Fever Treatments vs. Long Fever Treatments in Specific Diseases, *Alvin W. Folkenberg*, M.D.; 3. Effect of Short Wave Radiation on Living Organisms, *Albert W. Bellamy*, Ph.D. *Cleon W. Symonds*, M.D., President, First Trust Building, Pasadena, Calif.; *Clinton D. Hubbard*, M.D., Secretary, 2304 Gage Avenue, Huntington Park, Cal.

Chicago Tumor Institute

The Chicago Tumor Institute was opened March 21, 1938 at 21 West Elm Street. It proposes to conduct research and to offer training to physicians who may wish to qualify as specialists in the study and treatment of this disease. The institute also intends to offer consultation service to physicians in the diagnosis and treatment of cancer and radiation facilities for cancer patients.

Serious Heart Diseases Caused by External Nerves

Ventricular fibrillation, a fatal heart condition, and auricular fibrillation, also a grave cardiac disorder, have been found to be caused by the external nerves of the heart, it is indicated by the researches of Drs. Louis H. Nahum and H. E. Hoff of the faculty of the Yale School of Medicine. Dr. Nahum reported on his work to the New Haven Medical Association, of which he is the retiring president.

In normal hearts, Dr. Nahum explained, the external nerves, the vagus and accelerator, regulate the beat, but in abnormal hearts, it is these nerves acting with other agents that bring about fatal rhythms.

In cases of benzol or chloroform poisoning, and electric shock, it is the accelerator nerve, together with adrenalin liberated by the glands, that cause changes from the normal heart beat to the ventricular fibrillation, Dr. Nahum said. This fatal heart beat can be prevented by removing the accelerator nerve from the heart and excising the adrenal glands, Dr. Nahum found.

The vagus nerve, on the other hand, was found to promote auricular fibrillation. In the presence of an excess of thyroxin, from the thyroid gland, as in certain goiter patients, or in the case of electric shock, the vagus nerve, according to Dr. Nahum, becomes over-active and instead of following its usual rôle of slowing the heart, brings on the irregular auricular fibrillation. — *Science News Letter.*

Meetings of Physical Therapy Organizations

In this permanent column will be published information about meetings, election of officers, etc., of physical therapy organizations. New data should be sent promptly to the office of the Secretary, 1100 Park Avenue, New York.

American Congress of Physical Therapy, and American Occupational Therapy Association; Palmer House, Chicago; September 12th to 15th; Dr. Richard Kovács, 1100 Park Avenue, New York, Secretary, American Congress; Mrs. Meta R. Cobb, Executive Secretary, Am. Occup. Therap. Assoc., 175 Fifth Ave., New York.

Special Meetings: Special Committee on Physical Therapy, New York County Medical Society. John D. Currence, M.D., Chairman.

Pennsylvania Physical Therapy Association; meetings at the Philadelphia County Medical Society Building, third Thursdays from September to June; Dr. Arno L. Zack, 216 East Broad Street, Bethlehem, Pa., Secretary.

Pacific Physical Therapy Association; meetings at Los Angeles County Medical Association Building, fourth Wednesday. Clarence W. Dail, M.D., Sec'y., Treas., Loma Linda, Calif.

Kings County Medical Society, Physical Therapy Section; meetings at 1313 Bedford Avenue, Brooklyn, bi-monthly on second Thursdays; Dr. H. T. Zankel, 5 St. Paul's Place, Brooklyn, Secretary.

Physical Therapy Session; New York State Medical Society, New York City, May 11th. Madge C. L. McGuinness, M.D., Chairman; Harold J. Harris, M.D., Westport, N. Y., Secretary.

Western Section of the American Congress of Physical Therapy and Pacific Physical Therapy Association, 6th annual session, June 9 and 10, 1938, Los Angeles County Medical Association Building, Los Angeles, Clarence W. Dail, M.D., Secretary, Loma Linda Sanitarium and Hospital, Loma Linda, Calif. (See detailed announcement of program, elsewhere this issue.)

New England Physical Therapy Society; meetings at Hotel Kenmore, Boston on third Wednesdays from October to June; Dr. William McFee, 41 Bay State Road, Boston, Mass., Secretary.

New York Physical Therapy Society; meetings on first Wednesday from October to May; Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York, Secretary.

Yogic Breathing Exercises Change Body Processes Little

Breathing in special rhythms, as practiced by the Yoga cult of India as a preliminary to thought concentration, has relatively little effect on the bodily processes, Drs. Walter R. Miles and K. T. Behanan of Yale University told members of the National Academy of Sciences at their annual meeting here today.

In the Yogic breathing exercises, several "patterns" are followed. In some, the breathing is relatively light and rapid; in others, very deep, and as slow as only once a minute. Some of the exercises change from one pattern to another.

Dr. Behanan, who is a young Hindu, followed a Yogic regimen for two years, while physiological measurements were made on his bodily processes. It was found that during the breathing exercises, lasting from ten to thirty minutes, the metabolism or physiological life-speed was increased considerably. The effect, however, was transitory.

"In the case of Bastrika pattern where shallow and deep breathing are alternated within each minute, the after effect is more definitely prolonged and is in the direction of a reduced metabolism," the two investigators reported. "No reliable difference in oxygen consumption is found between experiments on mental concentration and normal quiet periods. The study suggests that artificial breathing patterns, if they influence mental concentration, do so probably more in psychological than in physiological terms." — *Science News Letter.*

Controlled Sound in Drama Sways Emotion of Audience

How changing the pitch of sound can produce tenseness and excitement in an audience and bring some members of it to the verge of hysteria was described by Harold Burris-Meyer, of Stevens Institute of Technology, New York City, before the meetings of the Acoustical Society of America.

Speaking on the use of controlled sound in the drama, the Hoboken scientist told how experiments had disclosed that all sounds in the theater could be directed from a single switchboard just as lighting effects are now varied.

The softest whispers can be made audible to all people in the theater without anyone suspecting that he is not hearing the normal tone of the actor. Opera singers, for example, will no longer have to develop the lung capacities of heavyweight prizefighters to sing above the accompaniment of a too-ambitious thirty-piece orchestra. The new system permits a singer to be heard from any part of the stage and without the artificiality which comes when the tenor has to step to the footlights — while the stage action stops — to deliver his aria.

While there is no direct connection between the emotions, and a sound canont engender love, hate or fear, Mr. Burris-Meyer cautioned, it is possible for sounds to suggest indirectly something which will stimulate these emotions. Thus the audience can share more completely the motivation of the actor. "Soft lights and sweet music" are something more than the name of a song: they indirectly build up a feeling of romance in an audience watching a love scene. — *Science News Letter.*

Two Hormones, Twins of Those Known, Found in Pituitary

Two new hormones from the pituitary gland, each a twin to already known pituitary hormones, were reported by Dr. Leo Loeb, of Washington University, St. Louis, in an address to the American College of Physicians following his presentation with the John Phillips Memorial Medal of the College.

The new pituitary hormones act on thyroid and female sex glands, respectively. Scientists had previously recognized a species difference in the extracts from the pituitary that influence thyroid and sex glands. An extract from the pituitary gland of a cow has a stimulating effect on the cow's sex glands but just the opposite effect on the guinea pig's glands, for example.

Investigations conducted by Dr. Loeb during the past two months and reported in Philadelphia for the first time show that this different effect is due to the production by the pituitary of two different hormones with antagonistic effects on female sex glands. In the pituitary glands of cattle, the ovary-stimulating hormone predominates while in pituitary glands of other species of animals the antagonistic hormone predominates.

The presence of these two hormones, where only one was formerly thought to exist, may have a relation to the anti-hormone effect discovered by Dr. J. B. Collip and associates of McGill University, Dr. Loeb said. Dr. Collip and associates have found substances called anti-hormones in the blood of men and other animals that check the effect of the pituitary hormones.

Dr. Loeb's other recent discovery of two thyroid-stimulating hormones from the pituitary may throw further light on the cause of Graves' disease or exophthalmic goiter, the disease characterized by pop-eyes, rapid pulse and other disturbances. Dr. Loeb and other scientists have been able to produce all the Graves' disease symptoms in healthy animals by giving them doses of thyroid-stimulating pituitary hormone, which suggests that disorder of the pituitary may be a cause of this kind of goiter. Dr. Loeb is now studying the pituitary glands of persons who died of Graves' disease. He hopes to find which of the two thyroid-stimulating pituitary hormones predominate in these glands, and thus may be responsible for the development of Graves' disease. — *Science News Letter.*

Old Age Might Be Postponed 15 Years by a Proper Diet

Old age can be postponed from 10 to 15 years by eating a diet containing larger amounts of calcium, protein, vitamin A and vitamin G, Dr. Henry C. Sherman, professor of chemistry, Columbia University, stated in a report made at the Carnegie Institute of Washington.

The studies were conducted on rats because the chemistry of rat nutrition is so much like that of human nutrition that the data obtained with rats do not need to be discounted when applied to humans.

The rats were divided into two groups. One group was fed a diet containing enough vitamins and other necessary food substances for the animals to grow, remain healthy and bear young. The second group of animals was given what Dr. Sherman calls an optimum diet, differing from the first by having more milk in it. The extra milk supplied more calcium or lime, more protein and more of vitamins A and G. The animals on this optimum diet lived much longer than the first group of animals, and in addition had more vitality.

Interpreted in terms of human life, Dr. Sherman said that the gain the rats made was equivalent to extending the span of human life from 70 years to 77 years. The period known as "the prime of life" was extended even more in proportion. Signs of senility that would appear in normal individuals on an adequate diet at 65 years of age would be postponed by the optimum diet to 75 or 80 years.

Dr. Sherman's studies on diet's effect on length of life were made with the cooperative assistance of the Carnegie Corporation of New York and the Carnegia Institution of Washington.

Dr. Sherman pointed out that among the rats on both diets, as would be the case in human experience, a considerable proportion die natural deaths before the attainment of these ages.

According to present knowledge, Dr. Sherman believes life and vitality could be extended by a moderate increase in the calcium of the diet, by eating not more than twice the minimum amount of protein and by taking about four times the amount of vitamins A and G needed for normal nutrition. — *Science News Letter.*

"Silver Salve" Kills Germs; No Harm to Tissues

A "Silver Salve," slowly releasing infinitesimal soluble particles of a silver salt to kill bacteria in infections, was described as a new healing agent by Prof. John H. Müller of the University of Pennsylvania in an address before the meeting of the American Philosophical Society.

Silver bullets were reputed to be able to kill evildoing witches in olden times; more modernly, silver is used in various forms to kill evildoing germs. Silver nitrate and arygrol are among the most familiar of these antiseptic forms of silver in current use.

However, all known forms of silver have certain disadvantages. They are apt to irritate the delicate mucous tissues even while they banish the bacteria; and once in a while one hears a report of a case of "argyrism" resulting from massive doses — a condition in which the skin and eye-white are permanently discolored, and become painfully sensitive to light.

To keep the advantages of silver as a germ-killer and yet avoid these drawbacks, Prof. Müller of the University of Pennsylvania has developed his new method of medical application, for a silver compound hitherto unused. This is anhydrous oxide of silver, which Prof. Müller mixes intimately with an oily substance. Applied to an infected area, this silver salve gradually releases the infinitesimal particles of the germ-killing metal, which dissolve and attack the disease organisms without harming the tissues.

The new method of silver medication has been tried extensively, both on laboratory animals and on human patients, Prof. Müller stated, and always with satisfactory results. — *Science News Letter.*

Measurements of Ultraviolet Radiation, and Illumination in American Cities 1931 to 1933

During the years 1931 to 1933 a survey of atmospheric pollution was made by the United States Public Health Service in Baltimore, Boston, Buffalo, Chicago, Cleveland, Detroit, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, and Washington. In this survey the atmospheric pollution due to smoke was recorded, samples of the dust in the air were collected and analyzed, and various meteorological factors, such as relative humidity and wind velocity, were measured and recorded. The methods of the study and the principal results have been reported in Public Health Bulletin No. 224.

Prescribe More Vitamin D for Babies Than Is Needed

The amount of rickets-preventing vitamin D usually prescribed for babies is more than they actually need, Dr. Frederick F. Tisdall, of the University of Toronto, pointed out to the American Institute of Nutrition.

On the other hand, even the so-called "good diet" may not contain as much vitamins A and B as it should, Dr. Tisdall indicated. The idea seems to be that while the child may be getting along on the amount of the A and B vitamins in a "good diet," he would do much better if he were fed a diet containing more of these vitamins — what Dr. Tisdall called the optimum amount.

Studies on humans show, he said, the need for further investigation of the present dietary standards in childhood, with a view to revising these standards.

A satisfactory method of estimating the child's vitamin C requirements has not yet been found, he observed. — *Science News Letter.*

Individual Muscle Fibers Repair Selves After Injury

How single fibers of muscle tissue heal themselves after injury was demonstrated by Prof. Carl Caskey Speidel of the University of Virginia, before the American Association of Anatomists meeting at Durham, N. C. Prof. Speidel has evolved a delicate technic whereby cellular details in the tail of a

tadpole can be watched under a high power microscope — the tadpole being the while happily unconscious under anesthesia.

When the end of a muscle fiber is injured, as by an electric current or slight heat, it swells up and pulls back, immediately forming a hard, tough cap over itself. This cap persists for a time, but then dissolves into the liquid-filled vacancy it leaves. Muscle cell nuclei migrate. Presently the normal cross-striped appearance of the fiber is restored, and all is normal once more. The same fiber, Prof. Speidel found, can thus recover several times from successive injuries.

Male animals can be made to perform the traditionally female function of producing milk, Dr. W. R. Lyons of the University of California showed at the same meeting. After injecting into young male rabbits heavy doses of two female sex glands extracts, or hormones, he was able to squeeze milk out of their nipples which in male animals ordinarily remain in an undeveloped condition.

A relic of the reptilian ancestry of mammals was described by Dr. G. W. D. Hammett of the U. S. Biological Survey. It consists in a stage in the development of the red blood cells of the opossum, at which these cells closely resemble those of reptiles. The opossum belongs to one of the most primitive, least evolved orders of the mammals. The same reptile-like stage has not been found in higher mammals, Dr. Hammett said. — *Science News Letter.*

Present Status of Massage—Behrend

(*Continued from page 218*)

of the leading surgeons not only for chronic and subacute traumatic conditions, but also for acute stages of sprain, strain and other injuries. In these cases much skill and experience as well as good understanding of the kind of massage required is necessary. Skilfully given, soothing massage compares favorably with the neutral bath in the treatment of certain forms of insomnia. A tactful operator can often put the patient to sleep if there is no serious pain or distress. We have found sedative massage most valuable in dealing with restless, nervous and hypersensitive patients who have difficulty in getting normal sleep.

A brief reminder of a unique and valuable form of massage in conjunction with mobilization of the joints, which was advocated by Lucas-Championnière more than 50 years ago, may be interesting and helpful. He called attention to the use of very simple and gentle centripetal stroking in relieving the intense pain from spastic contractions of the muscles following a dislocation or fracture. Such stroking is often sufficient to overcome the contraction of the muscles and relieve the pain so that the patient is at ease and the dislocation can be reduced or the fracture set without an anesthetic. This is one use of massage that surgeons generally might do well to study.

Mennell of London, in describing this light stroking massage says, "Never be afraid of rubbing too gently or of giving too small a dose of mobilization: always fear that the massage is too heavy and the movement too great." He also states:

"The desired end is obtained . . . . by the slow and rhythmical repetition of a single movement, which, whatever may be the nature of the movement, is little more than a caress, performed with uniform speed and monotonous regularity; the only permissible change, as the pain passes away, being the slightest possible, but regularly progressive, increase of pressure; but — the most important point of all — without the smallest deviation in direction." He adds that one need never hesitate, or be afraid of not succeeding in relieving the pain and of not being able to reset the joint without an anesthetic.

In preparing to set a simple fracture of a broken humerus, for example, the arm should be gently but firmly supported, say by a pillow, and the stroking hand should encircle the extensor surface, stroking from the fingers upward over the shoulder to the spine at the rate of 12 to 15 times a minute, with barely perceptible gradual increase of pressure of the final 10 or 12 of the customary 50 strokes. Then one proceeds at once to stroke the flexor surface of the arm, upward, over the anterior aspect of the shoulder to the pectoral region in exactly the same way. Finally, the upper and lower joints are moved, very slightly two or three times, which appears to aid in maintaining the muscular relaxation with consequent comfort often for ten or more hours. The limb is immobilized between the treatments.

Therapeutic Value of Postural Correction—Nicholson and Laplace

(*Continued from page 233*)

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THE STUDENT'S LIBRARY

FEVER THERAPY. Abstracts and Discussions of Papers Presented at the First International Conference on Fever Therapy. Edited by Members of the American Committee. Cloth. Pp. 486. Price, $5.00. New York: Paul B. Hoeber, Inc., 1937.

It is due principally to the efforts of Drs. Walter M. Simpson and William Bierman that a large number of delegates of foreign countries held the first international conference on fever therapy in New York City during March, of last year. The papers there read were so numerous and so extensive that their printing in full would have required an unusually large volume at a prohibitive price. It is therefore to the credit of the editors that they have succeeded in bringing out excellently prepared abstracts in English, French and German, which provide the essential data of the essays read at the conference. There are in addition messages from the President of the United States, from the Honorary President, Prof. Wagner-Jauregg, and an especially cordial and enthusiastic one from Baron Henri de Rothschild. Especial mention is made of a patriarchal statement felicitatory in nature by no less an authority than the master electrophysiologist, Arsène d'Arsonval. It is, of course, impossible to give even a list of the titles of the papers read let alone a review of their contents. Suffice it to say that every phase, theoretic, physiologic, technical and therapeutic of artificial fever has been covered with great thoroughness, so that no one interested in this particular aspect of physical therapy can afford to miss its careful perusal.

ELEMENTS OF CHROMOTHERAPY. The Administration of Ultraviolet, Infra-Red and Luminous Rays Through Color Filters. By *R. Douglas Howat*, L.R.C.P. (Edin.), L.R.C.S. (Edin.), L.R.F.P.S. (Glas.). With Foreword by Sir *Henry Gauvain*, M.D., M. Chir., F.R.C.S. Cloth. Pp. 106 with 20 illustrations. Price 8/6 d. London: The Actinic Press, 1938.

This small volume comes warmly recommended by the distinguished orthopedic surgeon Sir Henry Gauvain, who speaks of it as a "provocative . . . much needed work." Such hearty commendation and fulsome praise from so celebrated a source will undoubtedly be responsible for added sales and no less an increasing number of critical readers who will seek the reason for the enthusiastic foreword. Dismissing the sale objective and reviewing the scientific facts and conclusion advanced by the author, we are informed in the space of eight rather abbreviated chapters about the antiquity and orthodoxy of light therapy, and of the intriguing qualities of chromotherapy (colored light therapy) which is said to have been successfully practiced from ancient down to modern times by every country except one's own. Strikingly paradoxical is the fact that while scientific England, America and other progressive countries were making history in the allied and therapeutic branches of medicine, the art of treating diseased states by red, white and blue lights remained the inspiration of the ancients, or of individuals whose work was refuted by time, and experience. The fact that the ancient Chinese swathed their smallpox cases in garments of red and that English housewives suspected certain virtues in red and indigo flannel is insufficient reason for descending to their pseudoscientific and superstitious level for the care of a condition which modern science has reduced to a rare event in civilized countries. The argument that wood-lice and earthworms prefer the more salubrious feelings associated with red color and avoid the cold environment associated with blue light, or that butterflies show a phototropism for blue and violet is no proof that the human has the same reactivity as that of a louse, a butterfly or a worm. In the absence of controlled studies, the data from which the author draws his deductions may be said to be suggestive and perhaps provocative so far as concerns his enthusiasm for colored lights, but hardly conclusive from a therapeutic point of view. Least impressive therefore, is the chapter dealing with clinical observations. His therapeutic orchestration of the entire gamut of photoradiation from infra-red to ultraviolet, is often utilized in a form of inharmonics that should spell failure instead of the favorable results obtained. How can the author explain the supportive action of red and ultraviolet light when Fritz Ludwig and Julius von Ries have pointed out the antagonistic action of these radiations on cholesterol, vigantol and ergot. One has yet to prove by the scientific method whether the human clinically reacts to colored light by psychic influence, or whether his response is like unto a mixture of animal, vegetable or mineral. Until such evidence is forthcoming, chromotherapy will remain the stamping ground of the metaphysician and the borderline practitioner.

THE ORIGIN AND PROPERTIES OF THE HUMAN AURA. By *Oscar Bagnall*, B.A., Contab. Cloth. Pp. 197 with illustrations. Price $2.00. New York: E. P. Dutton & Co., Inc., 1938.

Not only is one immediately attracted by the intriguing title of this volume, but on reading one comes to the conclusion that the author has propounded certain facts which are at least provocative and stimulating if not altogether puzzling. The author endeavors to present the facts elicited from his studies on the existence of a human aura with all the misgivings and reticence of a researcher groping in a field as mystical as anything which has emanated from that terrain of treacherous logic where faith is interpreted as fact. The critical approach introduced by Bagnall, who has attempted

to continue the work of the late roentgenologist, Walter J. Kilner, on "The Human Atmosphere (Aura)," provides the reader with a detailed exposition of the experimental evidence and physical methods utilized to study and interpret this unknown and as yet mysterious phenomenon. To the credit of the author it must be pointed out that he has tried to interpret his findings on objective evidence. As such he has devoted chapters for the discussion of what constitutes the normal and abnormal aura in living humans, its appearance and variation in health and disease. He raises certain questions beyond the scope of present knowledge of physics, which at the same time are presented as physical evidence of the existence of both an inner and outer aura visible by means of certain types of colored lenses. To dismiss the problem as the abberations of a pseudoscientific individual, sincere but misled, is but begging the question. It does not constitute a legitimate answer to the facts provided even though as yet unverified by science. Whether this be a misinterpretation of evidence, or evidence still uncorrelated with present knowledge, the author has at least introduced certain provocative facts in need of further confirmation and classification. Is it a photo-electric or photo-chemical phenomenon? The author theorizes in that direction. Under the circumstances much of the information must at the moment be accepted with that restraint approved by the author, until that day when critical investigation will (1) confirm its objective, and (2) its physical nature.

JOHANNES DE MIRFELD, HIS LIFE AND WORK. By *Sir Percival H.-S. Hartley*, Consulting Physician to St. Bartholomew's Hospital and Brompton Hospital, etc., *Harold Richard Aldridge*, Formerly Scholar of Peterhouse, Cambridge and Assistant Keeper in the Department of Manuscripts in the British Museum. Cloth. Pp. 191 with 4 plates. Price, $4.50. Cambridge: The University Press; and New York: The Macmillan Company, 1936.

The life and works of Johannes de Mirfeld here so eruditely described carry the reader back to the romantic and medieval period of the medical England of Richard II and into the Priory of St. Bartholomew, then located in the suburb of Smithfield but now a part of pulsating modern London. It presents not only a cross section of fourteenth century life in England, but provides a colorful picture of church and state and medical practice in London of some five centuries ago, which helps to clarify some of our clouded impressions of the comparative progress of our profession from ancient to present time. Mirfeld in his Latin writing makes no claim to originality of thought or practice, but fully acknowledges his debt to the famous exemplars of continental authorities, particularly to Bernard's de Gordonio of the University of Montpellier, and the like, who were the first to transmit the twelfth century general revival of learning to the more or less isolated outposts of European influence. The volume provides both excerpts in the original Latin and in English translation from the authors' voluminous labors and introduces examples of genuine historic documents of the nature of medical activities accepted by the profession who lived in the period both of the Black Prince and Chaucer, and of Adam Rous, the surgeon of King Edward III. It is even fascinating to contemplate that during Mirfeld's residency within the Priory of the Hospital of St. Bartholomew he must no doubt have even ministered to Wat Tyler who was brought to the Priory to die following the eventful interview with the young king during the incident of the Peasant's Revolt in 1381. As already stated this work presents in excerpt form certain of the more interesting and perhaps important opinions of Mirfeld and his times. His *Brevarium Bartholomei* here presented in abbreviation in the original Latin and in English translation was once regarded as the encyclopedia of his period. The work was an intermixture of empiricism, superstition, magical lore, in which incantations and charms were as much a part of routine practice as was common sense mixed with romantic herbalism. Example of this is to be found in the second and third sections of this volume which introduces full chapters and short commentaries to illustrate the then prevailing opinion of the author on "Signs of Evil Portend—Death"; on "Phthisis" (no doubt the type of treatment here advocated was used on Edward the Black Prince, who died of tuberculosis); healing of wounds by plasters, the concoction of which demonstrated a naivcity as ignorant and innocent as anything that emanated from the scholastic dark ages. On the other hand the work also contains many very interesting observations, gems of expression as terse and poetic as is to be found in the works of Shakespeare. There is a pungent terseness of phrasing that is intermixed with classical proverbs worthy of quotation. We read that "too much familiarity doth breed contempt," an admonition for the physician to maintain a dignified distance as practical today as then. We are warned against over generosity as follows:

"When Physick's dearly bought, it doth much healing bring,
But when 'tis freely given, 'tis ne'er a useful thing."

Accordingly, the book will unquestionably appeal to those who value the historic and cultural background offered by such a work. It adds depth and breadth to our information of medical practice in London of five centuries ago, educational contrasts for the greater appreciation of a noble and ancient calling.

BIOLOGICHESKOYE DESTVIYE ULTRA-VUYSSOKOY CHASTOTUY (Biologic Action of Ultra-short Frequency). Edited by Prof. *P. S. Kupalov* and Docent *G. L. Frenkel*. Cloth. Pp. 471. Price, 13 roubles 50 kopecks. Moscow: All-Union Institute of Experimental Medicine, 1937.

This book while containing essays by various authors, most of whom have presented the results of independently carried out laboratory experiments, has been arranged to cover physico-technical, biologic and clinical problems in three separate parts. A fourth part discusses the contemporaneous literature, no less than 56 closely printed pages containing bibliographic references, Russian as well as foreign. It is clearly impossible in the limited space

to present the titles of the essays let alone to review their contents. Suffice it to say that one finds in this work descriptions of physical problems worked out with mathematical precision, description of the apparatus that have been constructed, and details of manifold and painstaking animal experiments, in which studies of the effect of the ultrashort waves on blood occupy a prominent place. In the main the various experimenters are in accord with many concepts held by other observers, but the most interesting are the claims that the shorter the wavelength the greater is the penetration and absorption of electrical energy, and that for therapeutic purposes there is no need of converting electrical energy into heat, polar application creating a concentration of ions in the living cell and thereby a state of hysteresis or excitation at any desired depth. In other words the thermic effects are not the sole criterion of therapy. There are also essays dealing with dosage, the dangers of the application of short waves and their prevention, and a resumé of many cases successfully treated for a large variety of diseases and external lesions. In the reviewer's opinion most of the articles are of such high scientific order that they merit translation and widespread dissemination.

Transurethral Resection—Hyams

(*Continued from page 238*)

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INTERNATIONAL ABSTRACTS

Physiotherapy in the Treatment of Pneumonia. J. Walter Torbett, Jr.

Texas State J. Med. **33**:432 (Oct.) 1937.

The most effective manner of administering oxygen is an oxygen chamber, using 40 to 50 per cent; few of these chambers are available, however, and this method, therefore, is not practical. The next efficient and more practical method is the use of tents and the newer insufflation machines; the latter are very effective and economical. Other methods are useless. Oxygen should be used continuously and not in short intervals.

Bullowa and Mayer conclude that the hazards outweigh the advantages.

The value of conventional diathermy has definitely an established place in the treatment of pneumonia. This present report reviews the results in thirty-two consecutive cases studied in the years 1934, 1935, and 1936. All were treated with portable short wave diathermy of 12 or 22 meter wavelength. Serial portable bedside roentgenograms were made every other day. Additional treatment consisted of inhalations and chest bakings three times a day. Glucose was given in some cases. Neither oxygen nor serum was used. Unfortunately, typing was not done in any of these patients. This group was not studied to compare with other methods, but an effort was made to determine just what happened when pneumonia was treated with short wave diathermy. Torbett arrived at the following facts:

For each year the average duration of illness ranged from 8.4 to 10 days. The total number of cases was seventy-eight, of which number fifty-six patients, or 71.62 per cent, recovered, and twenty-two, or 28.38 per cent, died. The total number of days from onset to normal temperature was 464 days, or an average of 8.6 days. The average number of days from onset to death was 7.4. Termination of illness by lysis occurred in twenty-two cases, or 39.2 per cent; by crises in thirty-four cases, or 60.8 per cent.

The author in his summary states: (1) The mortality rate was low in his small group of consecutive cases of pneumonia treated by short wave diathermy. (2) Short wave diathermy was easy to give; there was little apprehension present. All patients and even children liked it. (3) It relieved pleural pain in almost 100 per cent of cases. (4) Respiration was made easier. (5) Sleep was sometimes induced. (6) Results were comparable to conventional diathermy and treatments were shorter and less frequent, causing a minimum of complications and disturbance to the patient. (7) Most cases subside by lysis rather than crisis. (8) Nothing injurious or harmful was noted. (9) The use of sedatives and opiates was reduced.

Physical Methods (Manipulations). Clement Nicory.

Clinical Journal **66**:333 (Aug.) 1937.

Limitation of movement in a joint is a potential source of strain and pain. Joint injuries are followed by a certain amount of immobility maintained by muscular spasm. As a consequence of such immobility adhesions may form. Adhesions drag on the synovial membrane on movement, giving rise to recurrent attacks of synovitis, muscular wasting and a general instability of the articulation. Restoration of full movement by manipulation followed by a rebuilding of the wasted muscles leads to rapid recovery.

The intervertebral joints are particularly liable to injuries owing to the considerable leverage acting on them. The discs act as shock absorbers. Their reduced efficiency with advancing years renders the intervertebral articulations more liable to injury. A large variety of local and referred pains may result from injuries and minor subluxations in this region. Pains referred to visceral sites not infrequently give rise to a faulty diagnosis. Intractable headaches, pseudo-anginal symptoms, a variety of aches in the pectoral and abdominal regions, pains or hyperesthesia in the upper or lower limbs of vertebral origin will often respond to manipulative treatment when all else has failed.

What is known as "locking" occurs not infrequently in the sacro-iliac and cervical joints. It is a subluxation kept up by muscular spasm which occurs during some form of excretion. The pain is sudden and severe, but may be relieved miraculously by the appropriate manipulation.

Tuberculous Ulcerations of Mouth and Pharynx. F. C. Ormerod.

J. Laryng. & Otol. **52**:675 (Oct.) 1937.

Tuberculous ulceration of the mouth and pharynx does not seem to be encountered often outside a special hospital for tuberculosis, but the disease causes a great deal of trouble and anxiety. In the last five years the author critically analyzed 21 ulcerations in the mouth and pharynx: thirteen were males, eight females; in laryngitis the proportion is about the same. The age of cases of the disease in the mouth and pharynx is slightly younger than in the larynx, mostly from 20 to 30. The patients with laryngitis live longer, and they may overlap into the next decade, so the incidence is probably much the same. Tuberculous disease in the pharynx and mouth is, nearly always, a complication of severe disease in the lung. Ormerod tried lactic acid,

and guaiacol, and trichloracetic acid, but the best of all treatments was diathermy.

Diathermy is better in the mouth and pharynx than the galvanocautery, though the latter is preferred for the larynx. Diathermy is applied under cocaine anaesthesia and a needle electrode is used for the edges of the ulcer, and a ball or button electrode for the base.

Febrile Albuminuria. J. W. Welti.

Am. J. M. Sc. **194**:70 (July) 1937.

Welti studied the relation of fever to albumin in the urine in forty patients receiving fever therapy. The patients treated were suffering from dementia paralytica, atrophic arthritis, gonococcal arthritis and chorea. All had a blood urea nitrogen within normal limits, a normal Mosenthal concentration test and several negative examinations of the urine for albumin. Fever was induced by means of the Kettering hypertherm and an average temperature from 105 to 106 F. was maintained for from four to six hours. A specimen of urine was obtained before the febrile period; a second specimen was collected after the fever had reached its height and had been maintained for several hours; the third specimen was the first urine voided after the temperature had fallen to normal. These urines were then examined as to specific gravity, reaction to litmus paper and for gross albumin by the sulfosalicylic acid reagent. The exact amount of urinary albumin was determined by the quantitative sedimentation method of Skevky and Stafford. In 95 per cent of the subjects the prefever urin albumin was below 0.03 per cent, and 80 per cent presented a figure below 0.02 per cent. The urine albumin exceeded 0.04 per cent in only one case. These are normal values and offer beter proof of absence of renal disease in the group than the blood urea nitrogen and the Mosenthal test. During the febrile period 22.5 per cent of cases showed a decrease in albumin with fever, while 77.5 per cent had an increase in the level of urine albumin. This increase was very definite, being more than 100 per cent in twenty of the subjects and more than 200 per cent in sixteen cases. On four occasions the albumin level increased 500 per cent. In spite of the rather large percentage rise, the actual albuminuria is not likely to be massive. During fever only nine of the forty cases showed albumin in the urine as determined by the sulfosalicylic acid method. The patients had a temperature elevation for only a few hours, but had this been maintained for days, as is the rule in infectious fevers, it is probable that larger amounts would have appeared. Comparison of the prefever and postfever urine albumin levels indicated that 70 per cent of the subjects continued to show an increase in albumin in the specimens voided after return of the temperature to normal. This suggests that the increased output is carried over into the postfever stage; the possible delay in voiding, however, must be considered in evaluating these results.—[Abst. J. A. M. A. **109**:741 (Aug. 28) 1937.]

Influence of Short Wave Treatment on Stomach. K.Neidhardt and H. Schlinke.

Balneologe **4**:305 (July) 1937.

Neidhardt and Schlinke studied by means of x-ray examination the behavior of the stomach after treatment with short waves, 6 meters in length. The experiments were made on fourteen patients, of whom ten were free from gastric disorders, two had an old duodenal ulcer and two had subacidity. After five minutes of exposure to the short waves there was noticeable in nearly all experiments a reduction in the tonus and the peristalsis of the stomach, whereas the secretion of gastric juice increased. When the short waves acted on the stomach for thirty minutes, the remnant of contrast medium in the stomach was in seven out of eight examined persons from two to four times as large as was the case in the same person without irradiation. Thus it may be concluded that exposure to short waves reduces the motor action of the stomach. In discussing the therapeutic use of short waves, the authors point out that it is contraindicated in bleeding ulcers. However, short waves may be tried in all spastic conditions of the stomach, whether they are due to ulcers or to other local changes, also in all conditions of hypermotility resulting from duodenal ulcer, acute gastritis, tabetic crises and so on.—[Abst. J. A. M. A. **109**:997 (Sept. 18) 1937.]

Bilateral Tuberculous Dacryadenitis. Henning Skydsgaard.

Acta Ophthalmologica **15**:128, 1937.

To the comparatively small number of about 30 published cases of tuberculosis in the lacrimal glands the following one is reported. Under local anesthesia the right lacrimal gland was partially extirpated and a piece the size of a bean is removed from the tissue of the lacrimal gland. Six days later the left lacrimal gland was also partially extirpated. The wounds healed by first intention. Microscopy of the right lacrimal gland showed tuberculous inflammation in the tissue of the lacrimal gland. The patient received 20 carbon arc light treatments, which was continued after his dismissal from the clinic. Examination performed about two months later revealed scanty palpable remains of the lacrimal gland tissue. At the examination carried out about a year after his dismissal, the ptosis had diminished considerably and the lacrimal glands were not palpable. His general condition had greatly improved.

Short Waves in Chronic Sinusitis. F. Talia.

Arch. di Radiol. **13**:23 (Jan.-April) 1937.

Talia reports satisfactory results from the treatment of nasal or paranasal sinuses by short waves in chronic sinusitis. He used waves 7 or 8 meters long and Schliephake electrodes of the condensing type in eight patients suffering from chronic maxillary, frontal or sphenoidal sinusitis. In chronic unilateral maxillary sinusitis the electrodes are placed over the sinus which is involved

by the pathologic process and on the contralateral occipital region. In chronic bilateral maxillary sinusitis the electrodes are symmetrically placed over each sinus. They should entirely cover the sinus. In frontal and sphenoidal sinusitis the classic occipitofrontal and bitemporal technics, respectively, are indicated. When various sinuses are involved the treatment is given alternately to the different sinuses. The treatments are given daily or every other day, up to thirty or forty during two or four months. Each treatment lasts for fifteen minutes during the first month or two months and for thirty minutes (and rarely for forty minutes) during the last month or two months. The treatment is discontinued for ten days at given intervals. According to the author the treatment is of value especially in chronic sinusitis of short duration. Maxillary sinusitis, especially of the inflammatory and suppurative forms, responds to the treatment better than other forms of chronic sinusitis. Suppuration is replaced by a serous discharge, which completely disappears shortly in the course of the treatment. Fever, headache, local pain to pressure and local Congestion promptly disappear. In some cases there is a transient slight aggravation of the symptoms early in the course of the treatment. The patients who do not respond favorably to the short wave treatment do not improve under medical treatment either and therefore should be subjected to surgery. The author advises cooperation between specialists in otorhinolaryngology and dentists, as the presence of caries or other dental diseases may maintain inflammation of the sinuses. When the x-ray examination of the sinus shows destruction of the bony walls together with inflammation, surgical intervention is indicated The results obtained in the author's cases were verified by x-ray examination of the sinuses some time after completion of the treatment. — [Abst. J. A. M. A. **109**:1408 (Oct. 23) 1937.]

A Parallel Drawn Between Experiences With X-Ray Treatment and Such With Short Waves. (Vergleichende Erfahrungen mit der Röntgentherapie und Kurzwellenbehandlung.) L. Landes-Leiner.

Med. Klin. **33**:1279 (Sept.) 1937.

There is a striking parallelism in the results obtained between short wave and x-ray treatment. Each method produces an hyperaemia, a relief of pain, a retardation of bacterial growth, and a rise in the phagocytic index. Accordingly both methods may be employed for the treatment of inflammatory and neuralgic diseases. Applying x-ray treatment in cases of neuralgia the author used small doses of about 50 r. With inflammatory diseases he used about 100 r for each application. If, in case of neuralgia, we should use short wave therapy, two short wave treatments are found to correspond to one x-ray treatment. With inflammatory diseases, about 5 short wave treatments of twenty minutes duration each, are found equal in therapeutic value to one x-ray treatment. With chronic diseases of a joint the therapeutic balance is even more against short wave treatment. However, there is a number of inflammatory and neuralgic diseases, where short wave treatment will be found of foremost value. This holds good with empyema of the accessory cavities and of the lungs. Short wave treatment in such cases is very successful owing to its thermal components. Short wave treatment is preferable to x-ray treatment also with multiple arthritis, the latter holding possibilities of greater general damage. However, with chronic articular rheumatism affecting one joint only, x-ray treatment should be given preference owing to its more marked and speedy effect.

Treatment of Excessive Growth of Hair. (Die Behandlung des zu starken Haarwuchses.) Alois Memmesheimer.

Med. Klin. **33**:1133 (Aug.) 1937.

Neither local application of thallium nor depilation therapy are effective for safe removal of hair. In the author's opinion the most suitable methods are Kromayer's punch technic, electrolysis and cold cauterization. The punch method consists in a complete removal of a single hair including the root by means of small rotating punch instrument. This method, however, is only of value in the case of a few single hairs. For extensive depilation its efficiency is limited or restricted because of the trauma owing to the rate of injuries, and circatrization provoked. On the other hand excellent results are achieved with electrolytic needles. Electrocoagulation operated by means of a diathermy apparatus proved equally successful, of more speedy effect, hence more pleasant to the patient, and less painful (cold cauterization). The author introduces 5 needles simultaneously and sufficiently spaced (at least the different needles by 0.5 — 1 cm.) to insure rapid healing. The first application should be made at a less conspicuous place below the chin, in order to determine the dosage for individual tolerance.

The Indications for Treating With X-Rays the Entire Human Body: Leucaemia, Aleucaemia, Polycythaemia, Lymph Granulation, Metastatic Formations in Case of Tumors. (Die Indikationen zur Bestrahlung des ganzen menschlichen Körpers mit Röntgenstrahlen: Leukämie, Aleukämie, Polycythämie, Lymphogranulom und Tumormetastasen.) W. Teschendorf.

Fortschr. d. Therap. **13**:481 (Sept.) 1937.

According to our present state of experience the indications for treatment are as follows: Cases of leucemia, aleucemia and polycythemia are beneficially treated with total radiation. Irradiation of fields (as of glands, or of the spleen in case of leucemia and aleucemia) may be of adjuvant effect. In such instances "sectional irradiation" may also be applied in the place of total irradiation, the entire body being treated by sections. Most favorable results are obtained if in case of lymph granulation sectional total irradia-

tion is combined with irradiation of fields. The method of sectional total irradiation appears superior here to the one of simple total irradiation of the entire body, mainly on account of being adaptable for larger single doses. Secondary symptoms are of relatively less frequent occurrence. Sectional total irradiation is also qualified for the treatment of cancer metastasis. As a result, many cases of osteoklastic metastasis (cells dissoloing bones) are transformed into osteoplastic metastasis with relief of pain. Retrogression takes place more often from very small dosage as compared with the method of radiation now commonly used.

Effect of Radio Short-Waves On Tubercle Bacilli and Tuberculosis. H. J. Corper; Maurice L. Cohn; M. G. Simpson, and C. Bower.

Am. Rev. of Tuber. **36**:763 (Dec.) 1937.

Short wave exposures were carried to the point of producing acute burns in rabbits' ears without appreciably affecting the viability of tubercle bacilli injected intracutaneously in graded amounts. An illustrative experiment with a 60 meter apparatus (5,000 kilocycles) used at 2-hour intervals daily for a total of 24 hours, gave no effect. Other wavelengths within the range of the authors' experimentation proved equally inactive.

To test the effect of prolonged short wave treatment on the development of experimental generalized tuberculosis in the guinea pig, a series of animals was infected intravenously with 2 cc. of a 0.01 mgm. per cc. of fine suspension of a recently isolated virulent human strain of tubercle bacilli. These animals were divided into two groups, one was subjected continuously to 2.8 meter treatment for 30 days, while the second group served as control. In addition, non-infected guinea pigs were treated to observe any effect of the radiation itself. All the infected animals, treated or not, showed a loss of weight, which was not evident in the noninfected guinea pigs, whether rayed or not. At the end of the 30 days, autopsy showed no difference between the treated infected pigs and those only infected but not treated. Radiation alone caused no appreciable gross changes in the uninfected guinea pigs. The infected guinea pigs all showed a generalized moderate amount of tuberculosis.

Fever Therapy In Children. L. Spekter and A. McBryde.

J. Pediat. **11**:499 (Oct.) 1937.

Speketer and McBryde believe that severe reactions of fever therapy can be avoided by careful observation of the patient before and during treatment. The benefits derived from fever therapy outweigh the risks, especially in gonorrheal infections. Treatment at high temperatures is not devoid of danger. At Duke Hospital about 430 fever treatments (at temperatures varying from 104 to 106.7 degrees F.) have been given to 280 patients (thirty-two children). Four deaths occurred in adults. If the patient tolerates the first three hours of fever, the remaining two to nine hours of treatment usually will progress smoothly, provided there is an adequate intake of fluid, the patient is fairly quiet and the temperature is not allowed to go above 106.7 degrees F. In the thirty-two children, artificial fever has been used in treating gonorrheal infections, chronic infections arthritis, syphilis, chorea, encephalitis, Hodgkin's disease, tuberculous meningitis, undulant fever, interstitial keratitis and leukemia. — [Abst. J. A. M. A. **109**:2100 (Dec. 18) 1937.]

Action of Ultraviolet Light on Spores and Vegetative Forms of BB. Megatherium SP. Ferdinand Hercik.

J. Gen. Physiol. **20**:589 (March) 1937.

Spores and vegetative forms of a strain of B. megatherium were irradiated by ultraviolet light of the wave lengths 2536A, 2803A, and 3132A. The killing rate of both bacteria and spores is exponential, in agreement with irradiation results on other bacteria. Twice as much incident energy is needed to kill the spores as the vegetative forms (50 per cent death). The absorbed energy per bacterium for 50 per cent killing has been calculated on the assumption that the absorption of the vegetative cells is the same as that of the colon bacilli. These results are compared with previous measurements on other bacteria.

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